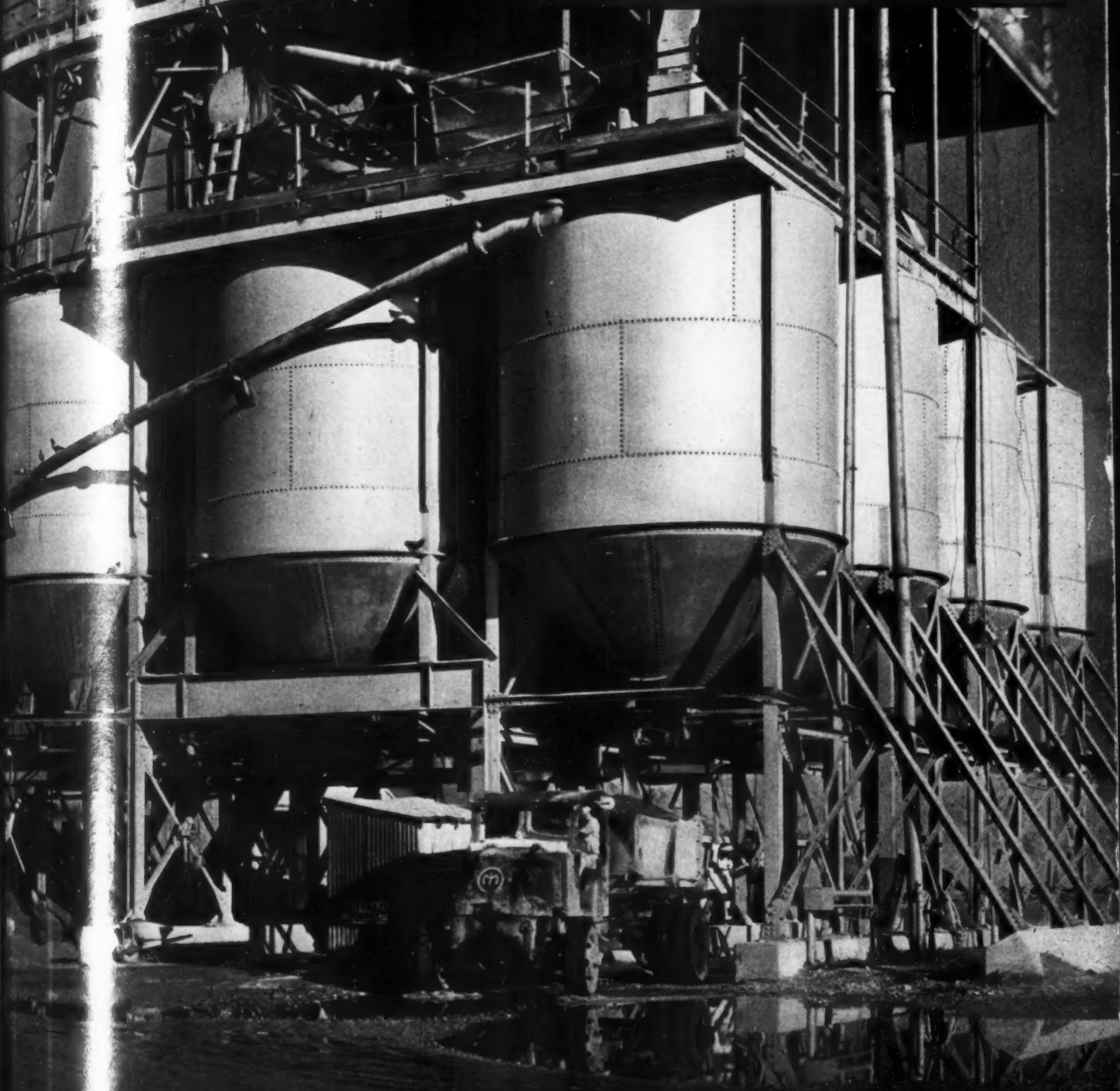


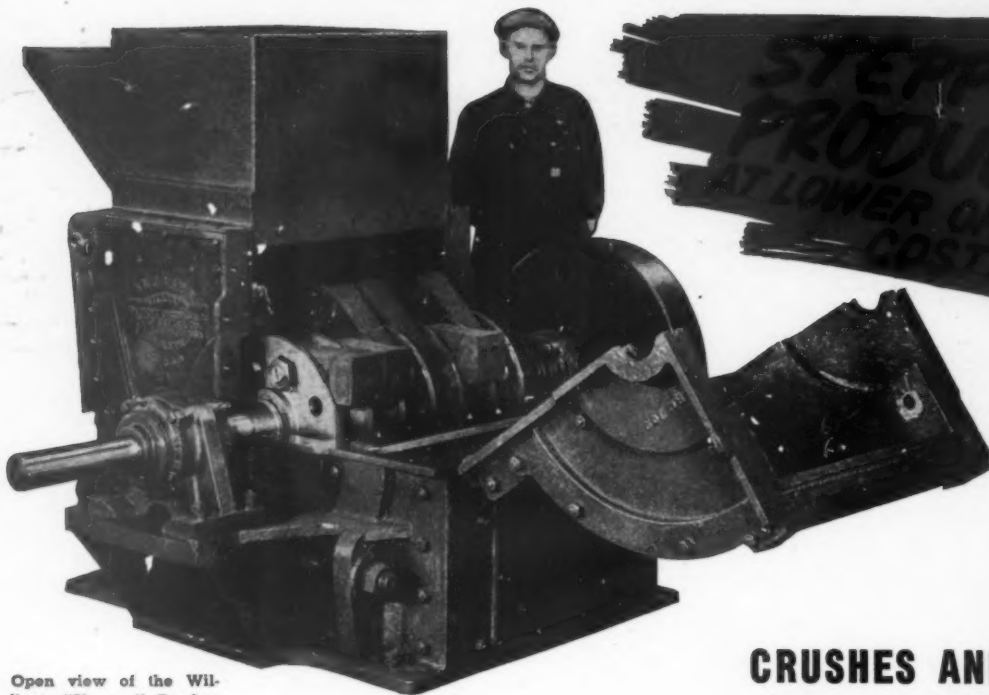
THE INDUSTRY'S RECOGNIZED AUTHORITY

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CEMENT • SAND AND GRAVEL • CRUSHED STONE • SLAG • LIME • GYPSUM
READY MIXED CONCRETE • CONCRETE PRODUCTS • INDUSTRIAL MINERALS



the Diamond Corp., rock and sand plant ★ FEBRUARY, 1946



Open view of the Williams "Slugger" Crusher showing heavy duty hammers, liners and discs.

The WILLIAMS "SLUGGER"
CRUSHES "ONE-MAN" SIZE STONE
TO 1 1/4", 3/4" OR AG STONE IN
ONE OPERATION

Design Features Include: Discs arranged so hammers can be set out as they wear on end; manganese steel breaker plates adjustable toward the hammers; front end is steel casting, 3 1/2 times stronger than cast iron; 1" thick manganese steel side cover liners.

CRUSHES AND PULVERIZES IN ONE OPERATION

The Williams "Slugger" Crusher and Pulverizer now makes it possible to crush large pieces of stone weighing from 75 to 100 pounds to 1 1/4", 3/4" or agricultural limestone in one operation. Sledging is eliminated. The unnecessary expense of a primary crusher is eliminated and the costly need for recrushing "overs" is eliminated. With seven sizes to choose from—all sturdily built for long lasting wear—every producer, whether large or small, can profitably install a Williams.

**WILLIAMS PATENT CRUSHER AND
PULVERIZER CO.**

800 St. Louis Ave.

St. Louis (6), Mo.



REG US PAT OFF

WILLIAMS
OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD
WILLIAMS
PATENT CRUSHERS GRINDERS SHREDDERS

In war or peace
B.F. Goodrich
FIRST IN RUBBER



33 buzz saws ganged up on this belt

A typical example of B. F. Goodrich development in rubber

IN THIS Southern hard wood lumber mill, 33 saws — band saws, edgers, slashers, trimmers — cut the logs into boards of the right length and width. All these saws are driven by one belt. But the constant strain and the sharp turns in the drive stretch the belt. And if it stretches too far, the mill shuts down while the belt is cut apart, shortened and the ends fastened together again.

They used to use expensive leather belts in this mill — belts that wore for only 5 years and stretched so badly

they had to be shortened 2 or 3 times a year. Then the mill owner heard of a transmission belt called Highflex — developed by B. F. Goodrich — that is especially constructed to resist stretching and can be made endless on the job. A B. F. Goodrich belt — 48 inches wide — was installed at less than half the cost of a leather belt. In exactly the same service it lasted — not 5 years — but *eight*, and had to be *shortened only once in its entire life*.

The mill owner's records showed that the leather belt had cost him \$1040 per year of service; the B. F.

Goodrich belt only \$300 per year.

These savings — resulting directly from the superior performance of a B. F. Goodrich belt — are typical of similar savings that can be made in all industry with almost any B. F. Goodrich product — whether it's belting or hose or any of the 35,000 rubber products that are constantly being improved by B. F. Goodrich research. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

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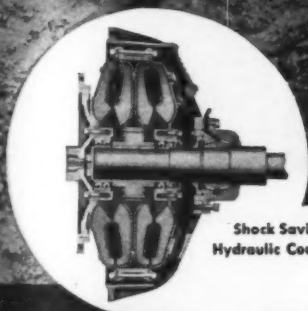
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Lorains are **LONG ON POWER**



Shock Saving Hydraulic Coupling

...And Short on Shock!

No job is too tough for a 2-yd. Lorain 82—the real rock shovel. This husky machine has plenty of power and extra rugged construction—but it has something even more valuable for rock work. And that's a life-saving shock absorber in the form of a hydraulic coupling!

This heavy-duty fluid coupling provides a perfect cushion between the engine and the load—eases strain on cables, boom and power transmission—increases machine life and cuts operator fatigue immeasurably. You'll never stall a Lorain 82 engine in rock or anything else.

Look into this real rock shovel now! You'll like the all-welded, all-steel boom; the center chain drive crawler and the all-steel dipper stick, too. Send for catalogs today.

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The men behind the DRILLS
Prefer



Photograph courtesy Miami Copper Company, Miami, Arizona.

TIMKEN BITS

Drillers who are fortunate enough to have the advantage of Timken Removable Rock Bits—and that goes for a very large and constantly increasing number—are enthusiastic about them. They have found they can drill more holes per shift with much less effort and trouble than they ever were able to do with conventional steels.

This is reflected in lowered costs for the mine operators due to saving in steel; virtual elimination of tramming; conservation of man hours.

Three factors enter into the superiority of Timken Bits. One is design—including thread and shoulder construction; the second is material—Timken Steel produced in our own steel plant; the third comprises care and accuracy of manufacture—Timken Bits are pro-

duced by specialists in a plant devoted exclusively to bit manufacture and equipped with the most modern machines and appliances for this purpose.

Now is the time to check into your drilling costs and to begin to reduce them by the adoption of Timken Bits—if you have not already done so. The Timken Roller Bearing Company, Canton 6, Ohio.



Another Northwest

in ROCK!



DRIVING the New Bozeman Pass Tunnel for the Northern Pacific was a Real Rock job and the Union Construction Co. of Great Falls, Montana, had real Rock Shovels to handle it with. Starting with two Northwest Rock Shovels in January the 300,000 Cu. Yds. of the approaches were out of the way before the middle of May.

Northwest brings you advantages that assure you better output in rock. Such features as the Dual Independent Crowd and the Northwest Welded Boom (and remember no Northwest Welded Shovel Boom has ever failed) warrant your investigation. Plan on Northwest Rock Shovel Performance on your future contracts—and you'll never have to worry about output on other classes of digging. We'll be glad to supply any desired information.

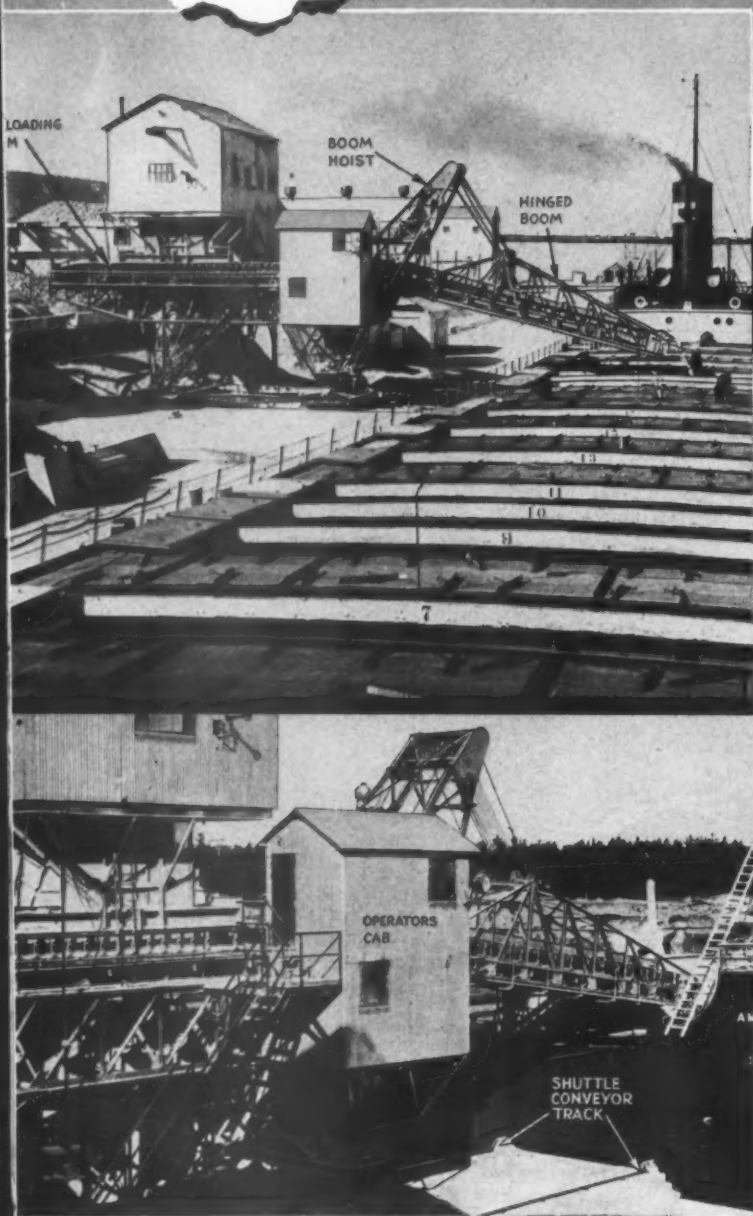
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*-and
when you have
a real Rock Shovel
you won't have
to worry about
output in dirt*

*The Problem —
to load crushed stone into
either ships or cars with
greatest economy in cost,
and minimum of dead
time for boats.*



Above views illustrate the utility of this S-A installation. Boom end of shuttle conveyor can be raised or lowered to provide shortest drop for stone regardless of position of vessel in water. The whole unit is quickly adjustable to permit loading of cars or ships, making it possible to load large volumes with a minimum of lost time.

THE SOLUTION —

**AN S-A MOVABLE
SHUTTLE BELT CONVEYOR**

Does Both

S-A engineers solved this two-way problem by installing an S-A shuttle type belt conveyor, mounted on tracks extending inland from the loading dock.

The conveyor can be moved in one direction to extend out over the dock and fill bulk freight boats at a rate of 3,000 tons per hour. The outer end of the conveyor is hinged to load stone with minimum drop, and with boats in high or low position in the water.

When moved away from the dock, the shuttle conveyor extends over the railroad tracks to load cars. In this position, the conveyor also clears any boat arriving or leaving the dock.

With the entire installation moved as a unit on rails, it can be rapidly spotted for fast, efficient loading of either cars or boats.

STEPHENS-A-DAMSON

7 RIDGEWAY AVENUE, AURORA, ILLINOIS MFG. CO. LOS ANGELES, CALIF. ★ BELLEVILLE, ONT.

Designers and Manufacturers of All Types of
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Reduction Crushers
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The main feature that makes this an unusually strong and efficient crusher is the all-welded steel frame. It is of sufficient depth to give a small angle, which, together with the curved jaw plates, results in the highest efficiency in capacity and size of product.

Other features are . . . separate Pitman Shaft Bearings—simplified and improved Swing Jaw Suspension, which saves wear and power—Curved Jaw Plates, which eliminate all choking.

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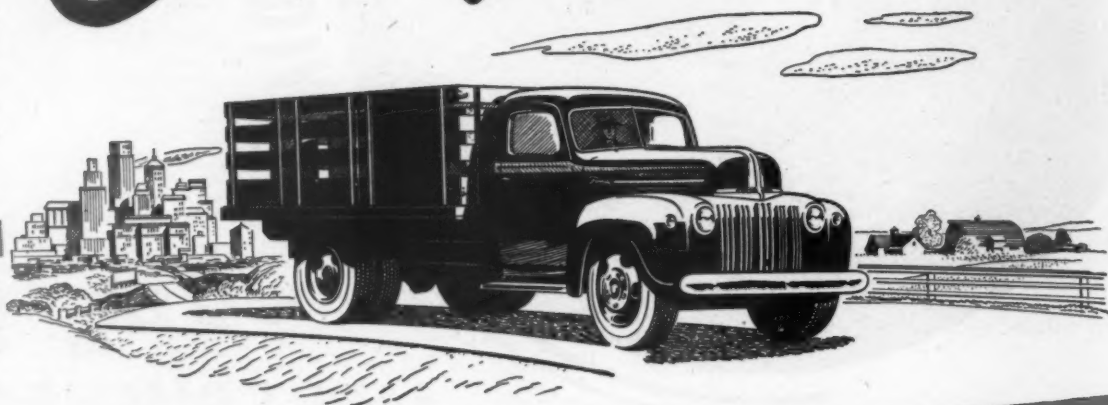
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Sets new performance standards on most critical drives

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Made in all standard cross
sections—lengths up to and
including 112 inches.

A Load-carrying section of endless
high-tensile steel cable

B Vents open between pulleys, dis-
sipating heat

C Vents compress rounding pulleys,
giving continuous gripping surface

D Highest quality rubber underbody

E Sturdy, bias-laid fabric cover
resists wear

**HIGHEST
LOAD CAPACITY**
—steel cables give greater
strength; near-zero stretch

SUPER-FLEXIBLE
—bends around smaller
pulleys without distortion

COOLER RUNNING
—deep vents dissipate heat
of rapid flexing

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MOLDED GOODS,
PACKING** built to the
world's highest quality
standard, phone your
nearest Goodyear
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tributor.

HERE is a revolutionary new version of Goodyear's famed steel-cable V-belt — the COMPASS-V-STEEL belt. Developed to meet military needs for a super-belt, it now comes to industry with a performance record that surpasses all previous standards. For, as the adjoining blueprint shows, it combines the unrivaled strength of steel-cable load carriers with the new flex-ventilated construction that dissipates heat of flexion, permits bending around smaller pulleys and gives you flat belt flexibility in a V-drive.

This results in many standout advantages. Lower power consumption! Highest heat resistance! Greater strength and shock-load capacity. Practically no creep or slip, no R.P.M. loss! Near-zero

stretch — minimum maintenance and adjustments. Widest speed range — from 10 feet per minute up to 10,000! It's the world's most efficient V-belt — *proved on more than 3,000,000 wartime installations!*

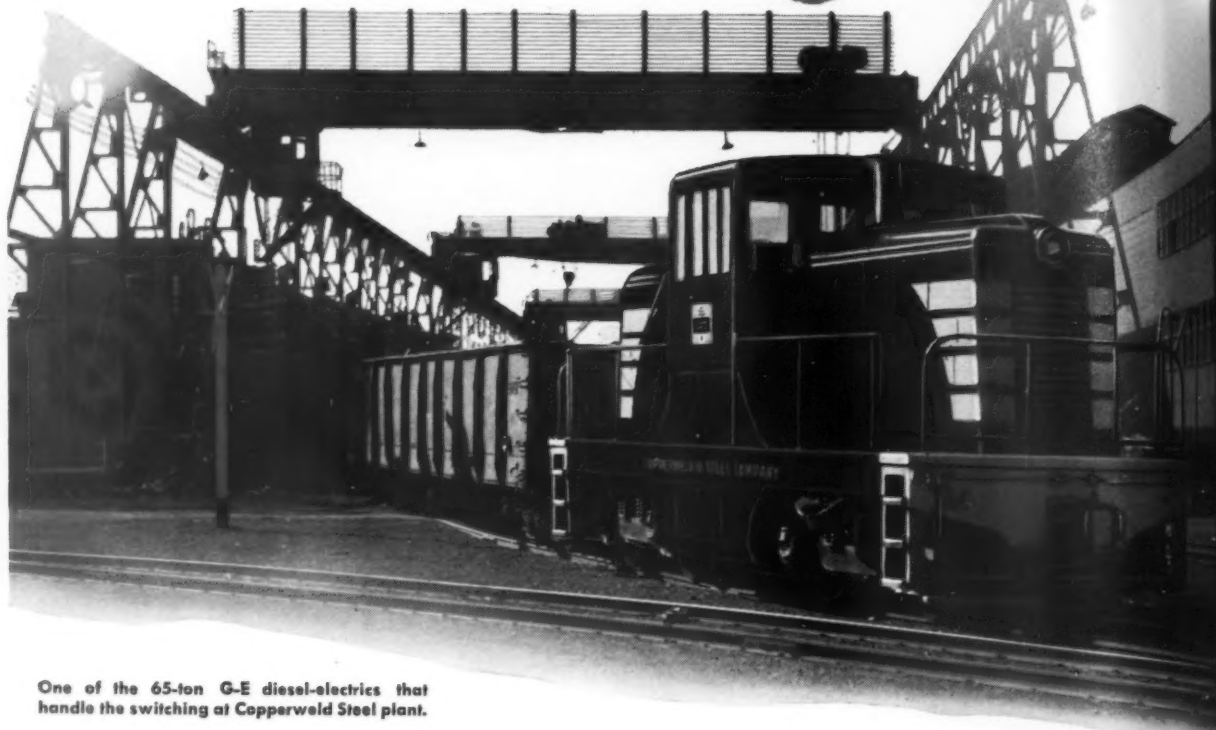
Operating-wise, this means you can handle heavier loads, get longer belt life by re-equipping present drives with COMPASS-V-STEEL — or you can get equal efficiency with fewer belts, smaller sheaves and shorter centers, eliminating many present monstrosity drives. For full particulars, horsepower ratings and other data, call in the G.T.M. — Goodyear Technical Man. Just write: Goodyear, Akron 16, Ohio or Los Angeles 54, California.

Compass—T.M. The Goodyear Tire & Rubber Company

GOOD YEAR
THE GREATEST NAME IN RUBBER

ROCK PRODUCTS, February, 1946

G-E diesel-electrics at cut switching costs \$.



One of the 65-ton G-E diesel-electrics that handle the switching at Copperweld Steel plant.

AN INVESTMENT WITH HIGH EARNING POWER

1. G-E diesel-electrics often return 20 to 30 per cent on the purchase price.

2. Availability is 90 per cent up! A diesel-electric carries sufficient fuel for several days' operation, runs for long intervals between overhauls, and requires only periodic inspections.

3. Starts on the press of a button. Less time is spent in getting locomotive ready for work.

4. Its fast, responsive operation speeds up switching.

5. Burns about one gallon (5 to 8 cents' worth) of fuel oil to do the same work for which a steam loco-

motive requires 100 pounds of coal (12 to 30 cents' worth).

6. Because of the absence of boiler, firebox, and heavy reciprocating parts, maintenance expense is greatly reduced.

7. Requires no fire cleaning, ash handling, watering, or watching; engine house attention is greatly reduced.

8. Its exhaust is clean; building and bridge maintenance is less.

9. Its light axle loading and short, rigid-wheelbase reduce track maintenance.

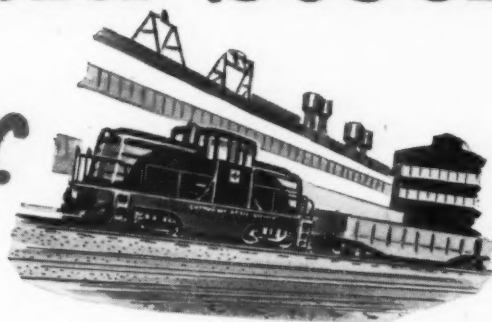
10. G.E. can furnish a wide range of standard sizes—25-ton, 45-ton, 50-ton, 65-ton, 80-ton.



A standard line—built for stock—quick delivery—low cost



at Copperweld Steel \$14 an hour



By replacing two steam locomotives with G-E diesel-electrics, Copperweld Steel Company has reduced total switching costs \$14 an hour. A 65-ton G-E diesel-electric was placed in service in 1943, and a second 65-tonner in 1944, replacing an 80-ton and a 40-ton steamer on the 16 1/4 miles of trackage at Copperweld's Warren, Ohio plant.

The steamers were costing between \$13 and \$14 per engine-hour to operate. The operating costs of the two diesel-electrics range from \$6 to \$7 per engine-hour. Thus the two replacements save a total of \$14 per hour.

The diesel-electrics work 24 hours a day, 7 days a week, except for an 8-hour period once in two weeks, which is all the time required for inspection and maintenance. The track to the slag dump has a 2 1/2 per-cent grade for some 800 feet. Up this grade the diesel-electrics regularly haul trains of six 50-ton cars. In fact, so satisfactory has been their all-around performance that another steamer is being replaced by a third 65-ton G-E diesel-electric.

Why not have a G-E representative make a survey of your own switching and hauling requirements, and give you figures on the standard type of G-E diesel-electric locomotive that will handle your job most efficiently.

APPARATUS DEPARTMENT

GENERAL  ELECTRIC

SCHENECTADY, N. Y.



Get your copy today!



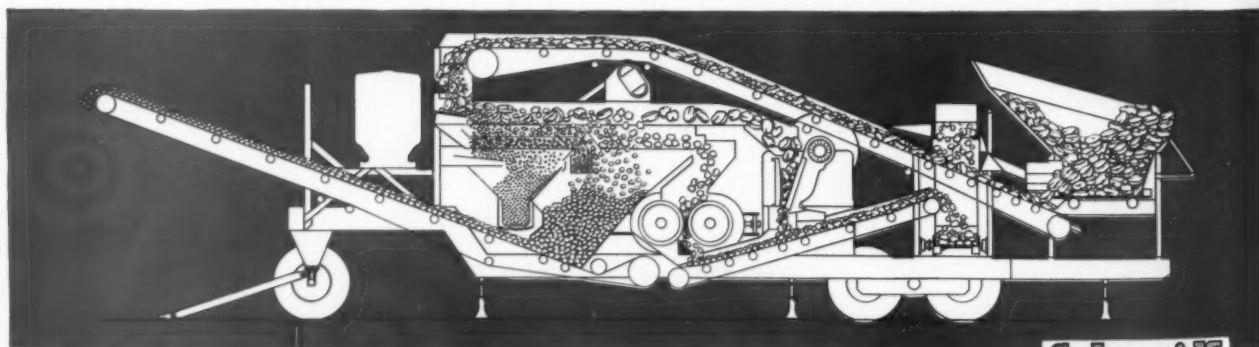
the new Cedarapids junior tandem

Get a copy of the brand new bulletin describing Iowa's newest portable straightline crushing plant, and you'll see why Junior Tandems are already setting records for high production at very low cost. Look how the material flows in a steady stream from the feeder through the plant taking full advantage of the high capacity of each unit with no waste motion. You never saw so much built-in flexibility arranged so effectively. Chip attachment and sand eliminator can be used as desired. Hopper and feeder are interchangeable with swivel feed conveyor to fit different loading conditions. Horizontal vibrating

screen assures greater capacity, closer grading, higher efficiency and requires less head room. Choice of 10" x 24" or 10" x 36" roller bearing jaw crusher. V-belts and universal drives eliminate chains and sprockets. Fast, easy set-up and takedown minimize lost time between jobs. No belts to put on and take off. No drives to connect. Conveyors swing easily into position. These are only a few of the many advantages that give the Junior Tandem such high capacity and such low operating and maintenance costs.

See your nearest Cedarapids distributor right away for full details.

Iowa Manufacturing Company, Cedar Rapids, Iowa



THE IOWA LINE of Material Handling Equipment Includes

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WASHING PLANTS
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STEEL TRUCKS AND TRAILERS

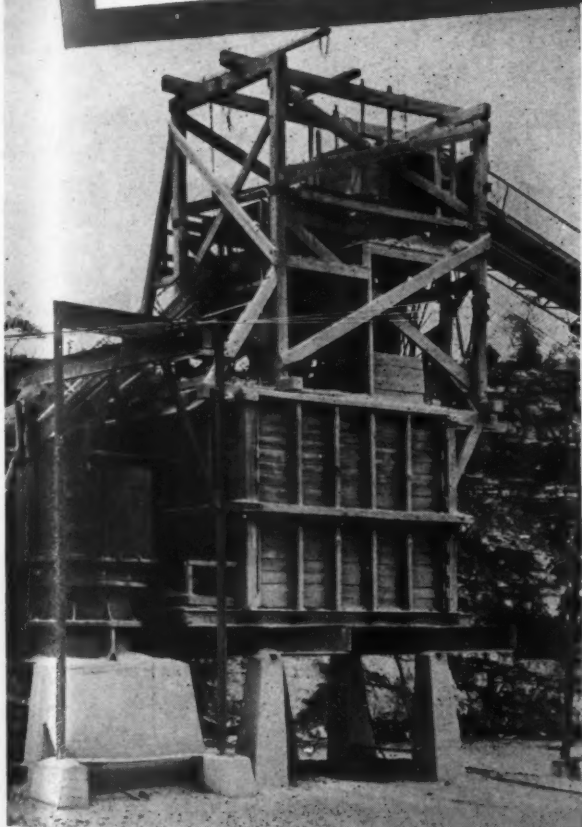
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PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS

Cedarapids

Build by
IOWA



Modernization with **TELSMITH** Steps-up Quarry Plant Output



New intermediate-crushing plant, with 16-B Telsmith Gyratory Crusher and 2-deck 4' x 12' Pulsator Screen

• New projects, new road construction, airport developments, municipal and state highway maintenance in the Reading, Pa. area, imposed new and heavier demands on the Berks Products Corp. rock crushing plant.

To turn out 1500 tons a day *consistently* with an increasingly larger percentage of finer sizes, called for plant modernization. But the many restrictions meant less manpower and a minimum of new equipment. Yet maximum operating efficiency was built in by using the right Telsmith equipment.

Roundabout handling and material flow bottlenecks were eliminated by relocating the primary jaw crusher down on the quarry floor and building a new conveyor-connected screening-and-intermediate-crushing plant half-way up the incline. Its 16-B Telsmith Gyratory Crusher takes the oversize from a Telsmith 4' x 12' 2-deck Pulsator Scalping Screen located above a 125-ft. bin for 3 sizes of product.

This relieves main plant screen from coarse scalping duty, gives far better classification, and faster, more flexible secondary crushing. And, in the main plant, the installation of a No. 48 Telsmith Gyrasphere Crusher, in closed circuit with the screens, assures top tonnage of fines in all desired sizes.

Planning modernization, expansion, or a complete new plant. Consult Telsmith engineers. Get Bulletin E-11.

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EASTON

Phoenix

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.... the finest body ever built
for shovel-loaded rock and ore

Practically

INDESTRUCTIBLE

On several operations the original EASTON PHOENIX cars have been in steady service for more than twenty years. Their owners will tell you that these old cars, battered and stained by age and hard usage, are hauling as much rock and ore today as ever. Constant heavy pounding of tons of shovel-loaded rock will leave a brutal mark on any container. But, where there are no moving parts (nothing but simple, rugged body strength) you can look forward to years of un-failing service long after the original paint has weathered away. Today, with modern design and engineering principles developed through years of field study, the famous EASTON PHOENIX is made better than ever.



PUT IT IN AN EASTON PHOENIX SIDE-DUMP, DOORLESS CONTAINER

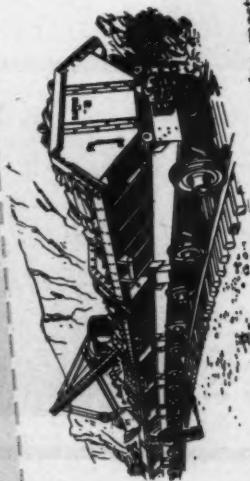
LOADABILITY: What goes on under your shovel dippers? The rugged, doorless EASTON PHOENIX container laughs at the roughest kind of treatment from the biggest rock your dippers can handle. No moving parts to cause trouble—no room for damage through warping. Designed for maximum width to provide the biggest possible target for your shovels. Top speed can be maintained throughout the entire loading operation.

DUMPABILITY: Side dumping means straight line operation—faster spotting and quicker take-offs at the dumping point. EASTON PHOENIX design assures complete, controlled feeding of every load. The dumping body is balanced on a new double-trunnion hinge to put gravity-return-action right to work at the highest point of elevation. Again, nothing to go wrong—no hang-ups in the body—not a second nor a penny wasted from beginning to end of the dumping cycle.

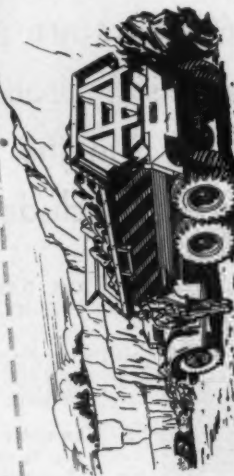
HAULABILITY: EASTON PHOENIX containers meet every requirement in the normal practise of handling rock and ore between your shovels and your fixed dumping point. EASTON PHOENIX cars, trailers or truck bodies are adaptable, respectively, to any make of locomotive, tractor or truck chassis. To shoot and load where you want to, when you want to, start your haulage plan with PHOENIX containers.

* * *

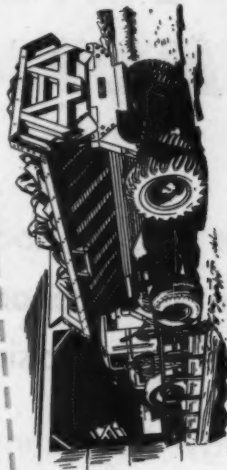
EASTON PHOENIX capacities range from 10 to 30 tons (and special EASTON bodies are limited only by the size and capacity of your shovel dippers and hoppers). Now, to get the modern haulage facts on your haulage problem, write for your copy of the new EASTON Transportation Statement, Form 176. Address: Engineering Counsel, Easton Car & Construction Company, Easton, Pa.



EASTON PHOENIX CARS—Most popular, most efficient rock and ore handling car in its field. Giving top performance on hundreds of installations throughout the world. The EASTON PHOENIX car provided the original testing ground for the PHOENIX container.



EASTON PHOENIX BODIES—One of the first back-mounted bodies to be used in rock hauling service. While still giving top performance on special applications, the back-mounted PHOENIX truck body has been generally superseded by EASTON PHOENIX trailers.



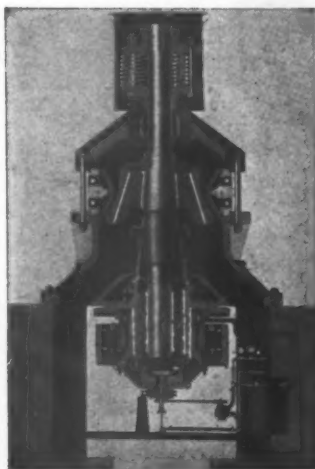
EASTON PHOENIX TRAILERS—Pioneer and unquestioned leader of the trend toward trailer haulage in rock and ore handling operations. EASTON TRAILERS are available with standard EASTON PHOENIX bodies up to 30 tons capacity, or with special container designs.

LET KENNEDY ENGINEERING MAXIMUM PRODUCTION FOR

Where modern Rock Products plants are setting new production and economy records, you'll find KVS precision-engineered, precision-built equipment on the job.

Kennedy-Van Saun are complete outfitters for sand and gravel, crushed stone, lime and cement producers.

KVS engineers are ready to advise you on your refitting and expansion problems. Representatives in principal cities in the United States and foreign countries including Ejido 7-503, Mexico, D. F.

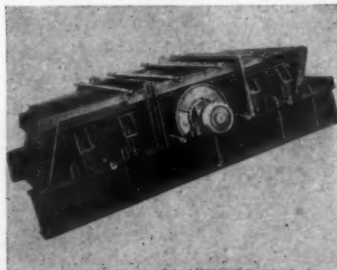
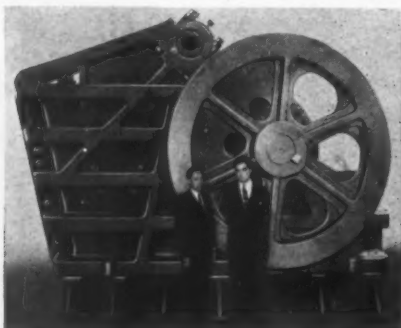


KVS BALL-BEARING GEARLESS CRUSHER saves 80% on maintenance and 50% in power over geared crushers. No power is wasted on gears since the motor is built directly into the pulley assembly.

Reversible grinding rings give double wear to wearing surfaces. Forced feed lubrication means long life for working parts. Easy accessibility, quick adjustment of crusher opening cut down standby time.

**ASK ABOUT THE
FAMOUS MODEL No. 49^{1/2}**

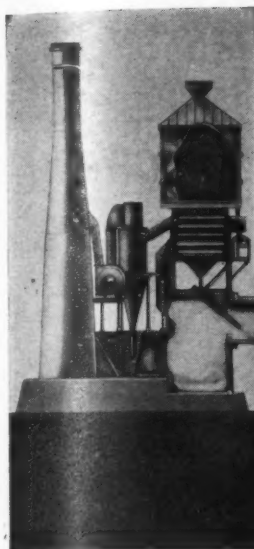
KVS SWING JAW CRUSHERS are the extra heavy duty type for handling large tonnages of toughest rocks. Available in sizes to meet all output and feed requirements.



KVS VIBRATING SCREENS give 95% sizing efficiency. Low installation and maintenance costs. Available in three types and many sizes.

KENNEDY-VAN SAUN MFG. & ENG. CORPORATION

AND EQUIPMENT GIVE YOU THE POST-WAR MARKET . . .



Save on long or short
kilns with **KVS** preheater
and deheater

KVS PREHEATER AND SOAKING PIT can be attached to your present long or short lime kiln. You can increase production and fuel efficiency of your present kiln the KVS way.

Using the preheater, soaking pit and deheater, we are making high grade lime in short kilns with less than 5,600,000 BTUs per ton of lime. Fuel savings average 40%.

KVS MACHINERY

KILNS	CONVEYORS
COOLERS	ELEVATORS
DRYERS	GRINDING MILLS
CRUSHERS	CLASSIFIERS
HAMMERMILLS	WASHERS
SCREENS	DUST COLLECTORS
FEEDERS	AIR SEPARATORS

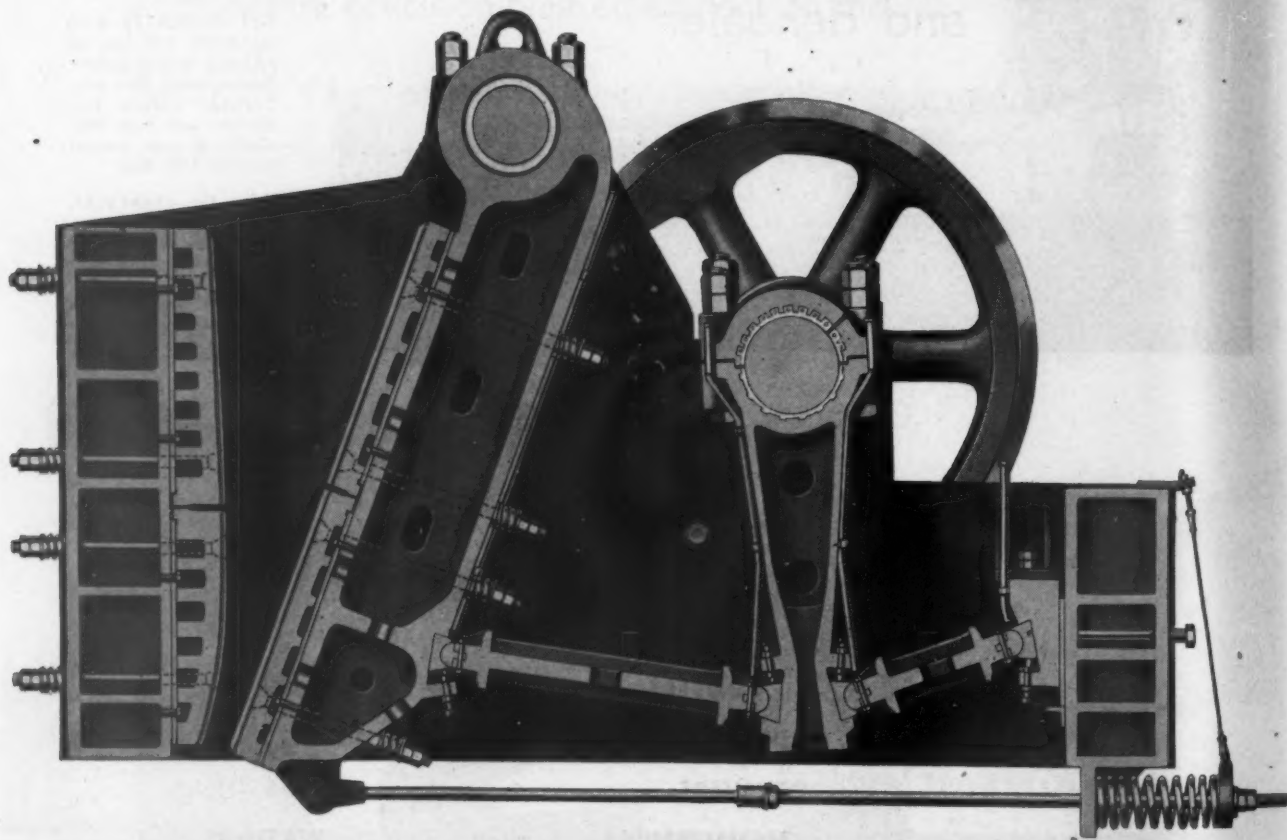
Complete Cement, Rock Crushing, Sand and Gravel,
Lime and Dolomite Plants.

WRITE TODAY FOR OUR CATALOG
and description on these and other
types of KENNEDY machinery.

2 PARK AVENUE • NEW YORK 16, N. Y. FACTORY: DANVILLE, PA.

Compare "A-1" Crusher

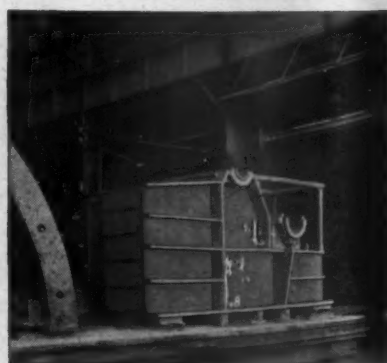
WITH CONVENTIONAL MAKES. YOU'LL FIND IT HAS UP TO 35% DEEPER CRUSHING CHAMBER--GIVES YOU INCREASED CAPACITY--LOW MAINTENANCE--AND TAKES LESS POWER!



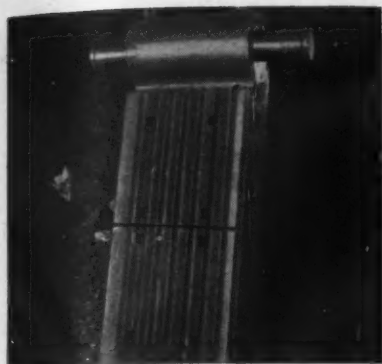
1 Have you rock or ore that's tougher and more abrasive than most? New "A-1" crusher may be what you're looking for! It's specially designed to handle heavy-duty, 24-hour-a-day jobs!



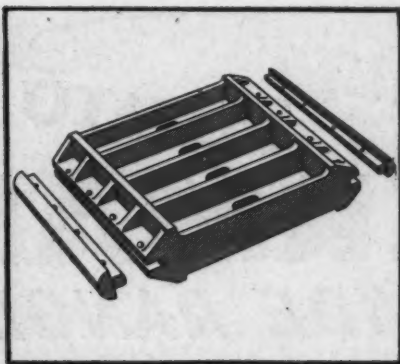
2 Where heavy lifts or clearances are not involved, frames are built in 1-piece. Side members are heavy, reinforced welded steel plate. End members are welded steel, box section design.



3 Frames are stress-relieved in this giant furnace! Once, after initial welding of sections together — again, after sides are welded to ends. Result: uniform strength, accurate frame.



4 "A-1" crusher's *exclusive* suspended-type jaw plates permit expansion of manganese steel. Renewable plates behind jaw plates eliminate costly wear on swing jaw and frame!



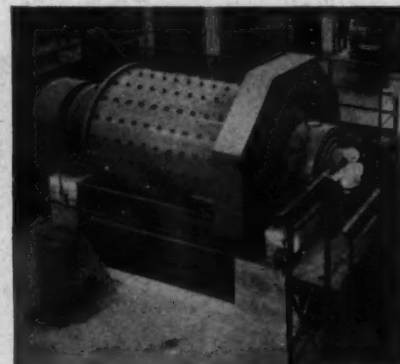
5 3-piece toggle plate, with renewable, large machined steel ends and seats supplied on 42" x 32" and larger sizes. Results in *smoother* operation, *longer* toggle and seat life, *lower* maintenance.



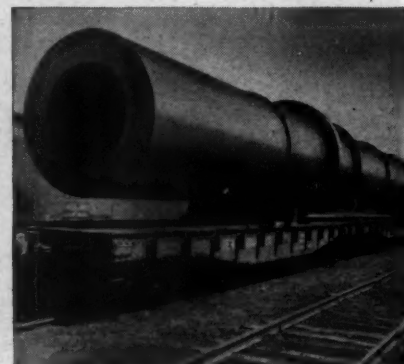
6 You're looking down *full-width* receiving opening of 60" x 48" "A-1" crusher installed in an iron ore concentration plant. Want details on "A-1" crushers? Write for bulletin B6369.



7 Got a screening problem? Perhaps A-C's modern "Ripl-Flo" or one of *seven other different* screens we build, can solve it! Yes, in every line A-C gives you wide choice! For example . . .



8 A-C builds *world's largest line* of single and multi-stage grinding mills—ball, rod, pebble, "Compeb" and "Ballpeb" types. Over 3700 mills now operating all over the world is an A-C record!



9 No, not "long tom" but an A-C rotary kiln. Products being treated in large quantities, at low cost in A-C kilns include cement, lime, ores, oxides, varied synthetic materials, etc.

LOOKING FOR ENGINEERING "KNOW-HOW"?

What kind—*Basic Processing Machinery*: screens, crushers, grinding mills, kilns, hoists, feeders? Or, *Power Generation, Distribution and Control*—pumps, motors, blowers, compressors, V-belt drives? A-C builds them *all*—offers you "know-how" in teaming them up!

A1969

ALLIS-CHALMERS

PRODUCER OF THE WORLD'S LARGEST
LINE OF MAJOR INDUSTRIAL EQUIPMENT!



MILWAUKEE,
WISCONSIN

CRAZY QUILT? POTATO MASHER?

THERMALLOY

MEETS A WIDE RANGE OF USES



**X-RAY
CONTROLLED**
HEAT AND CORROSION
RESISTANT

It is used in the Cement Industry—

This heat and corrosion resistant casting was made for a foreign calcining kiln and operates successfully up to 2000° F.

We make any type of alloy casting that our customers may require—whether it be a Kiln Feed End, Nose Ring, Feed Pipe, Drag Chain, Burner Pipe or "WHAT NOTS" like the one herewith illustrated.

**THERMALLOY or AMSCO
ALLOY. They are IDENTICAL.**



Thermalloy

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO.
X-RAY CONTROLLED

**AMERICAN
Brake Shoe
COMPANY**



*"They are light but—
they carry a lot of weight"*

ALTHOUGH light in weight, Multiwall Paper Bags have proved their ability — many times over — to protect cement and rock products from dampness and rough handling.

During the war — from 1942 to 1945 — more than 42 million tons of materials were shipped in Multiwalls. These specification-made kraft paper bags protected products from rain, salt spray, and the rigorous con-

ditions of wartime shipping . . . in tropical heat and arctic cold.

Looking forward

Today, we realize that the cement industry is looking forward to meeting the increased demands of America's postwar construction program.

St. Regis is also looking forward to supplying the Multiwall Paper Bags to assure the delivery of this essential commodity.



NEW YORK 17: 230 Park Ave.
BALTIMORE 2: 2601 O'Sullivan Bldg.

CHICAGO 1: 230 No. Michigan Ave.
SAN FRANCISCO 4: 1 Montgomery St.

IN CANADA:
St. Regis Paper Co. (Can.) Ltd.
Vancouver, British Columbia
Montreal, Quebec

Birmingham
Los Angeles

Boston
Nazareth, Pa.

Cleveland

Dallas

Denver

Detroit

Franklin, Va.

No. Kansas City, Mo.

Seattle

Toledo

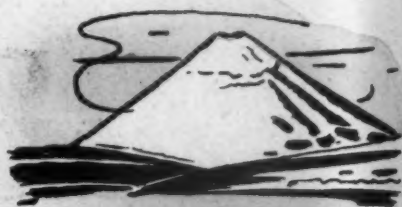


"This is Reinforced Primacord . . . for deep and ragged holes"

Reinforced Primacord is recommended for use in deep and ragged holes where extra tensile strength and resistance to abrasion are needed. Its detonating core of PETN is equal to that of Plain Primacord, but its additional cotton counter-jacketing gives Reinforced Primacord a tensile strength of 160 pounds.

Packed on wooden spools to facilitate handling in the field, Reinforced Primacord weighs only 20 pounds per thousand feet. It is flexible . . . down-hole connections to trunk lines are made easily with half hitches.

Two other standard types of Primacord-Bickford Detonating Fuse are available: Plain, for shallow holes and surface trunk lines; Wire Countered, for extremely deep or ragged holes where maximum resistance to abrasion is important.



FOR DEEP AND RAGGED HOLES!

THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONNECTICUT

P-15

PRIMACORD-BICKFORD

Detonating
• Fuse •

NOW...

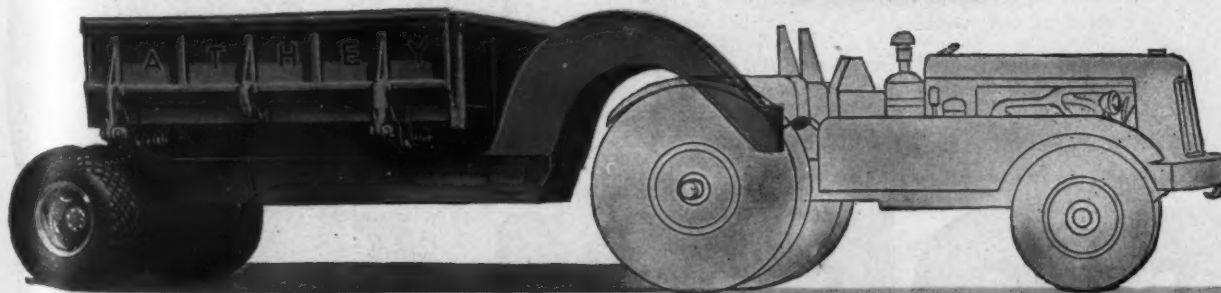
Athey Trailers

APCOR

RIDE ON RUBBER!

Since 1922, Athey has built a complete line of trailers and wagons, establishing a world-wide reputation for dependable equipment. Now, with its experienced engineering skill and manufacturing background in the trailer field, Athey announces a heavy-duty, 2-way dump trailer on rubber tires. Matched with the "Caterpillar" DW10 Rubber-tired Tractor in capacity and strength, the new PD-10 Trailer has such features as: fast, positive hydraulic control; 10 cubic yard capacity; discharge to either side; sturdy, long-life design and construction. Find out more details about the new PD-10 Trailer. Your Athey-"Caterpillar" Dealer can give you full facts or you're invited to write direct to
ATHEY PRODUCTS CORPORATION, 5631 W. 65th Street, Chicago 38, Illinois

2-WAY DUMP — POSITIVE, HYDRAULIC CONTROLS
 The new Athey PD-10 is 2-way dump — a money-saving advantage on many types of jobs; has fast-acting, positive hydraulic controls.



Athey
 APCOR



DEPENDABLE LOADING & HAULING EQUIPMENT



OLD MAN COMPETITION... is getting ready

**The right wire rope can help you
keep costs down!**

The heyday of high production, with cost a secondary consideration, is over.

All industrial equipment and supplies will have to be purchased with their cost-cutting possibilities a prime consideration. Equipment must *save* while it *serves*!

Wire rope in your business must do its part in cutting overhead too. Meeting competitive business, equipped with Roebling "Blue Center" Steel Wire Rope, is a *sure* step in this direction. The staying power and reserve strength of *any* Roebling Wire Rope, regardless of its type, is real economy over a long period of operation.

Unsurpassed facilities, research and practical engineering of America's pioneer wire rope

maker, assure you top service in installation or maintenance. Roebling Wire Rope will help to remove the danger of costly shutdowns due to replacements . . . will help you profitably meet the coming years of competition.

JOHN A. ROEBLING'S SONS COMPANY

TRENTON 2, NEW JERSEY

Branches and Warehouses in Principal Cities



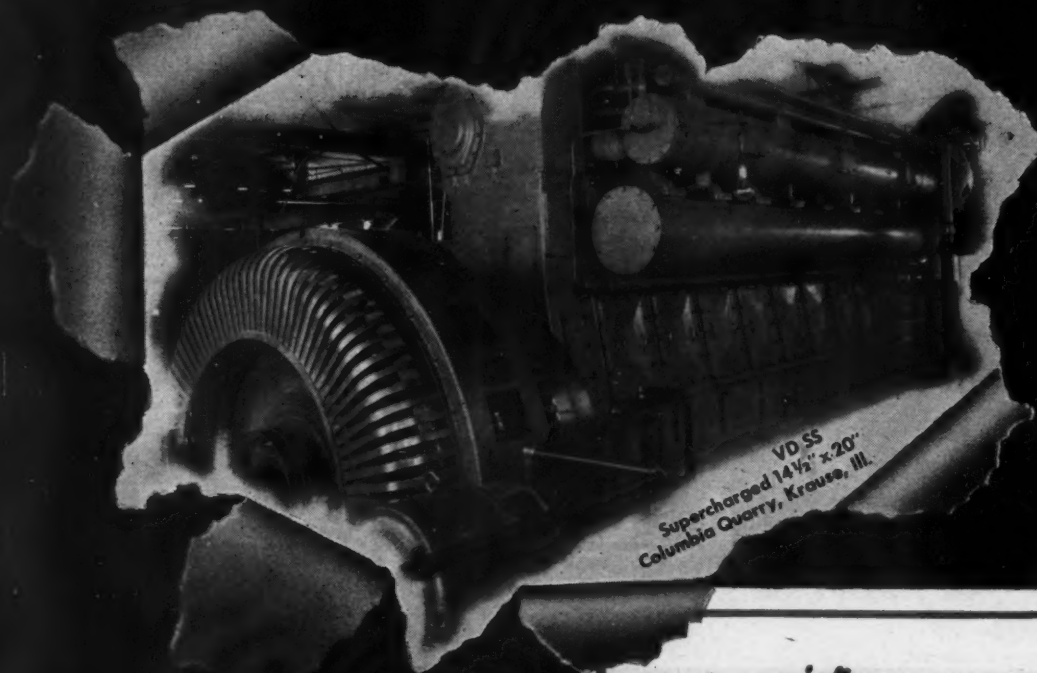
ROEBLING

PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • SLINGS • COLD ROLLED STRIP • AERIAL WIRE ROPE SYSTEMS • ROUND AND SHAPED WIRE • SUSPENSION BRIDGES AND CABLES • WIRE CLOTH AND NETTING • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS • ELECTRICAL WIRES AND CABLES • AIRCORD, SWAGED TERMINALS AND ASSEMBLIES

Superior
DIESEL

**a fine reputation
for economical power**



VD 55
Supercharged 14½" x 20"
Columbia Quarry, Krause, Ill.

Superior
ENGINES

Division of
THE NATIONAL SUPPLY CO.

Plant and General Sales Office:
Springfield, Ohio

SUPERIOR DIESELS - STATIONARY, 28 to 1325 H. P.
MARINE, 28 to 1325 H. P. - GENERATOR SETS, 20 to 930 kw.

Maybe we've been too Modest

ABOUT BEMIS MULTIWALL PAPER SHIPPING SACK FACILITIES

For years, Bemis has been a leading manufacturer of multiwall paper shipping sacks. Six plants, strategically located north, south, east, and west, have given Bemis customers in the cement industry the advantages of flexibility and capacity in production.

Even in the face of manufacturing and shipping difficulties during the past few years, this flexibility and capacity, plus the Bemis system of planned production, has enabled us to make an unusual record in fulfilling shipping promises and in maintaining quality for our regular multiwall customers.

When you need multiwall paper shipping sacks for your rock products, think of Bemis. It pays to be a Bemis Multiwall Paper Shipping Sack customer.



Peoria, Ill.



East Pepperell, Mass.



Mobile, Ala.



San Francisco, Calif.



Wilmington, Calif.



St. Helens, Ore.

Bemis Multiwall Paper Shipping Sacks

Peoria, Ill.

East Pepperell, Mass.

6 PLANTS

Mobile, Ala.

San Francisco, Calif.

Wilmington, Calif.

St. Helens, Ore.

BEMIS BRO. BAG CO.

OFFICES: Baltimore • Boston • Brooklyn
Buffalo • Charlotte • Chicago • Denver
Detroit • East Pepperell • Houston • Indian-
apolis • Kansas City • Los Angeles • Louis-
ville • Memphis • Minneapolis • Mobile



New Orleans • New York City • Norfolk
Oklahoma City • Omaha • Orlando
Peoria • St. Helens, Ore. • St. Louis • Salina
Salt Lake City • San Francisco • Seattle
Wichita • Wilmington, Calif.



VALVE
SEWN
TYPE

VALVE
PASTED
TYPE

*It's the REASON
for this Fact
that's Important*

Your Standard GATES VULCO ROPES
Are Today **OUT-PERFORMING** Any V-Belts
Ever Built Before

Early in the war it was found that no V-belts then being built by anyone could stand the combat-service requirements of the Army's tanks, tractors, and self-propelled big guns. For this unprecedented severity of service, Gates developed and built V-belts far stronger and more durable than any V-belts ever built before—and here is why this fact is NOW important to YOU:—

*HERE is
the reason*

Every improvement developed by Gates for these Army V-belts has also been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

Here is one of the very few instances in which improvements developed primarily for military use were passed on immediately to you. Ordinarily, that could not be done. Gates V-belts were made an exception because it was recognized that industry needed the best possible V-belts in order to achieve the greatest possible production—

and maximum production was one of the nation's vital needs.

That is why Gates has been able to pass on to you, day by day, every V-belt improvement developed for our armed forces during the war—and that is why your Standard Gates Vulco Ropes are today outperforming any V-belts ever built before!

All Gates
V-Belts are
Built With



THE MARK OF SPECIALIZED RESEARCH

THE GATES RUBBER COMPANY

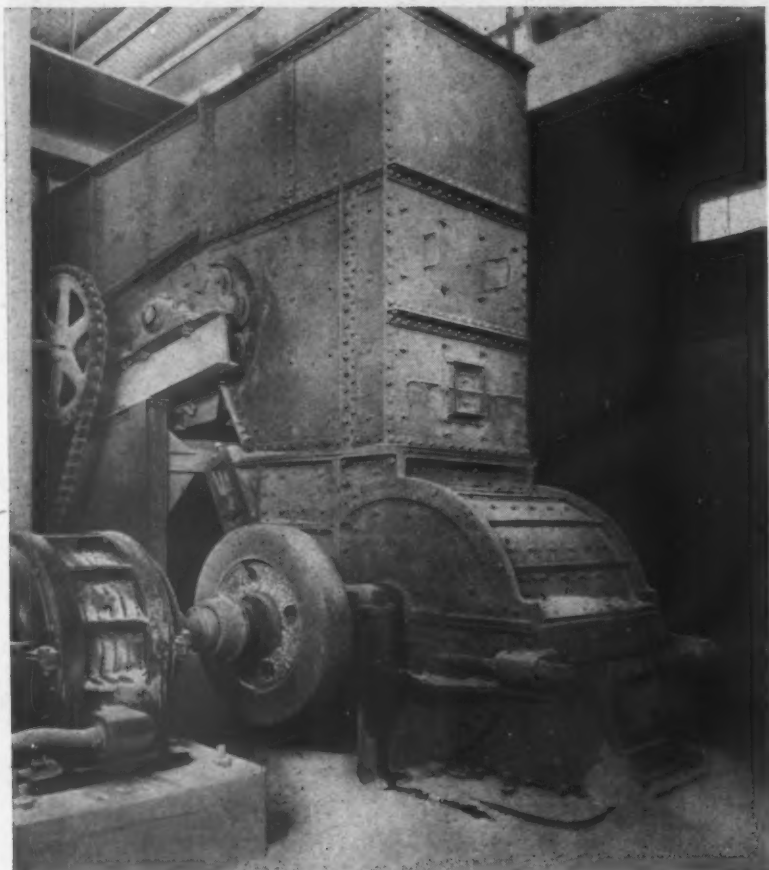
Engineering Offices and Jobber Stocks in All Large Industrial Centers

462

GATES VULCO ROPE DRIVES

CHICAGO 6, ILL., 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue. ATLANTA 3, GA., 521 C. & S. Nat'l Bank Bldg.
LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway. DETROIT 2, MICH. 223 Boulevard Bldg.
PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL., 170 Ninth St.

2½ CU. YD. Shovel Feed -- AT 250 TONS
PER HOUR



DIXIE NON-CLOG HAMMERMILLS

*The machine best fitted
for the operating conditions
peculiar to your plant*

WORK done by the powerful Dixie Non-Clog Hammermill shown here is typical of the bang-up job Dixie machines perform on all types of material. This hammermill crushes run-of-quarry feed from a 2½ cu. yd. shovel at the rate of 250 tons per hour. It offers outstanding features of advanced hammermill design—such as the Non-Clog moveable breaker plate and the adjustable feed end.

Dixie Hammermills continuously give a uniform, high quality product regardless of character of feed. Furthermore, enormous crushing power and wide range of reduction eliminates the need for three or four units to obtain desired capacity.

WRITE TODAY FOR COMPLETE DATA

Dixie Hammermills are made in 14 sizes with capacities ranging from 10 to 1000 tons per hour. All Dixie Hammermills are made to order; designed to fit the particular job on which they are to be used.

DIXIE MACHINERY MFG. COMPANY

4119 GOODFELLOW BLVD.
ST. LOUIS, MO.



Here's One Good Reason—why VULCAN CAST-STEEL SECTIONAL TIRES Always Give Dependable Service

The fact that every Vulcan Sectional Tire is completely assembled before final accurate machining is only one of many reasons why they always give good service when used to replace solid tires on a rotary kiln or dryer. Another reason is that they are always cast in circular form—the upper and lower halves being cast separately and then cut into semi-circles to make the four component parts.

Additional reasons include slow annealing at moderate temperature, to eliminate internal strains while still retaining the necessary strength and hardness to stand up under long-continued severe service.

Naturally the first cost of a Vulcan sectional tire is more than that of an equivalent solid tire, but on most replacement jobs the saving in installation costs—plus the sav-

ing in shut-down losses—is so great that no responsible executive can afford to overlook their ultimate economies.

If you operate rotary kilns, coolers, dryers or retorts, you may easily achieve important savings by ordering Vulcan Sectional Tires NOW and having them ready to slip on before trouble actually develops.

Close-up of tongue-and-groove joints on Vulcan sectional tire shown above. Bolt holes through the tire sections are reamed for 2" fitted bolts, with hex and jam nuts, and a dowel pin is used at each of the four end-joints.



VULCAN IRON WORKS, Wilkes-Barre, Pa.

Rotary Kilns, Coolers and Dryers	Toothed, Double-Roll Crushers	Heavy-Duty Electric Hoists	Steam Locomotives
Rotary Retorts, Calciners, Etc.	High-Speed Hammer-Type Pulverizers	Self-Contained Electric Hoists	Diesel and Gasoline Locomotives
Improved Vertical Lime Kilns	Ball, Rod and Tube Mills	Scraper-Loading Hoists	Diesel-Electric Locomotives
Automatic Quick-Lime Hydrators	Shaking-Chute and Chain Conveyors	Cast-Steel Sheaves and Gears	Electric Locomotives and Larrys



For more than 75 years, Union Pacific has served thirteen western states . . . been a partner in their development.

This vast fertile territory is more than the breadbasket of the nation. Due to its great wealth of industrial raw materials—ore, minerals, petroleum and lumber—it might also be called the nation's treasure-chest. Rivers have been harnessed—providing irrigation and power. And there is splendid rail transportation.

For example, in California, the Pacific Northwest and Missouri there is a large source of supply for the cement industry. Union Pacific has the equipment

and personnel to meet all the requirements of shippers in those regions.

These thirteen western states served by the railroad are ripe for postwar expansion. They have the materials, facilities and space.

Union Pacific will continue to play its part in the future progress of this western territory by providing unexcelled freight and passenger transportation over its Strategic Middle Route.

*Be Specific—
say "Union Pacific"*

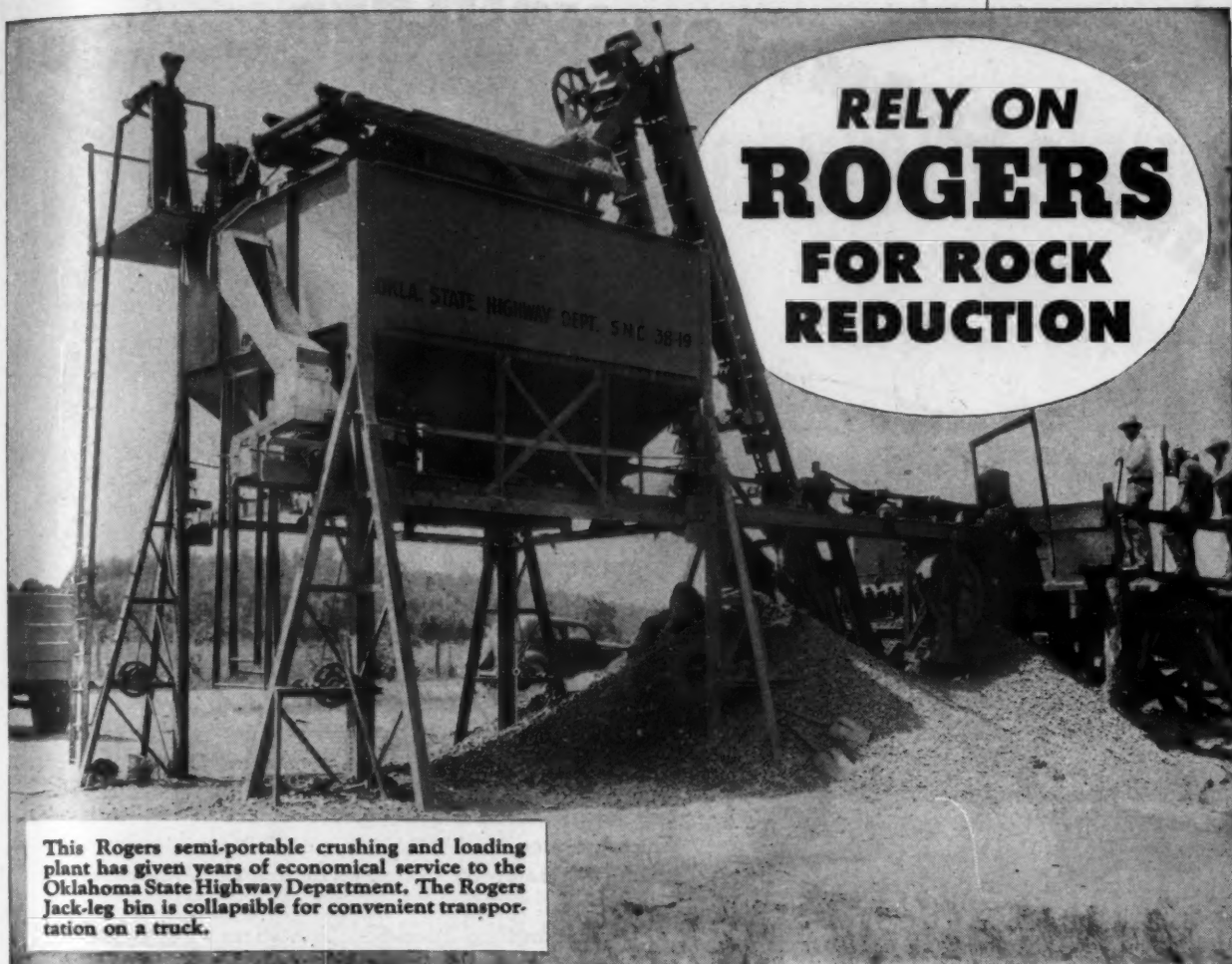


★ Union Pacific will, upon request, furnish information about available industrial and mercantile sites in the territory it serves. Address Union Pacific Railroad, Omaha, Nebraska.

The Progressive

UNION PACIFIC RAILROAD

The Strategic Middle Route



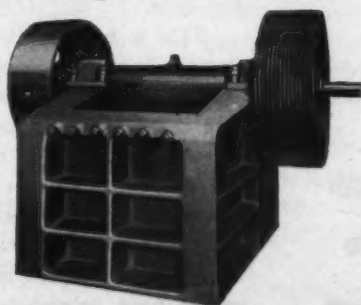
**RELY ON
ROGERS
FOR ROCK
REDUCTION**

This Rogers semi-portable crushing and loading plant has given years of economical service to the Oklahoma State Highway Department. The Rogers Jack-leg bin is collapsible for convenient transportation on a truck.

EQUIPMENT FOR CRUSHING...SIZING...CONVEYING...STORING

Rogers offers a complete line of rock reduction equipment—every piece built to the highest standards of performance, strength and reliability. When you "Rely on Rogers" for your equipment, you can be certain that no part of your operations will be handicapped by the failure of one link in the process. The extra strength and

extra capacity built into every Rogers crusher mean greater production at a lower operating and maintenance cost.



Rogers jaw crushers available in 16 sizes are so sturdily built that, despite greater capacity, there has never been a shaft or bearing failure reported in a Rogers.

ROGERS IRON WORKS CO.

JOPLIN, MISSOURI



Quarry Plants • Gravel Plants • Jaw Crushers • Roll Crushers • Belt Conveyors • Bucket Elevators • Screens • Feeders • Steel Bins

LIKE A CHAMPION VAULTER...



FORM-SET ROPE *is relaxed*

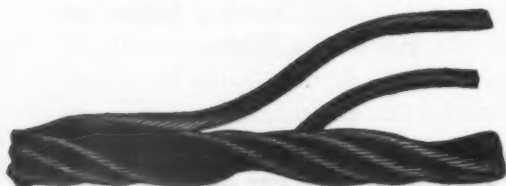
You marvel as his body clears the bar, then falls through space in a graceful arc. Thirteen, fourteen, fifteen feet he drops, yet he lands unhurt . . . because he's relaxed.

When handling Form-Set, Bethlehem's preformed rope, you'll notice much of that same relaxed effect. The reason is, of course, that the preforming process shapes each wire and strand to a permanent helix—a shape they retain through the life of the rope. Even though the rope be cut or broken, the wires and strands "stay put." They don't bush out or pop from the core.

This is because the tension is gone—relieved by preforming. The rope is relaxed.

What does this bring you? Easier handling, for one thing. More important still, a preformed line is much less subject to bending fatigue. On applications where bending stresses are high, a Form-Set rope has longer life. This means greater economy . . . fewer replacements . . . fewer riggings.

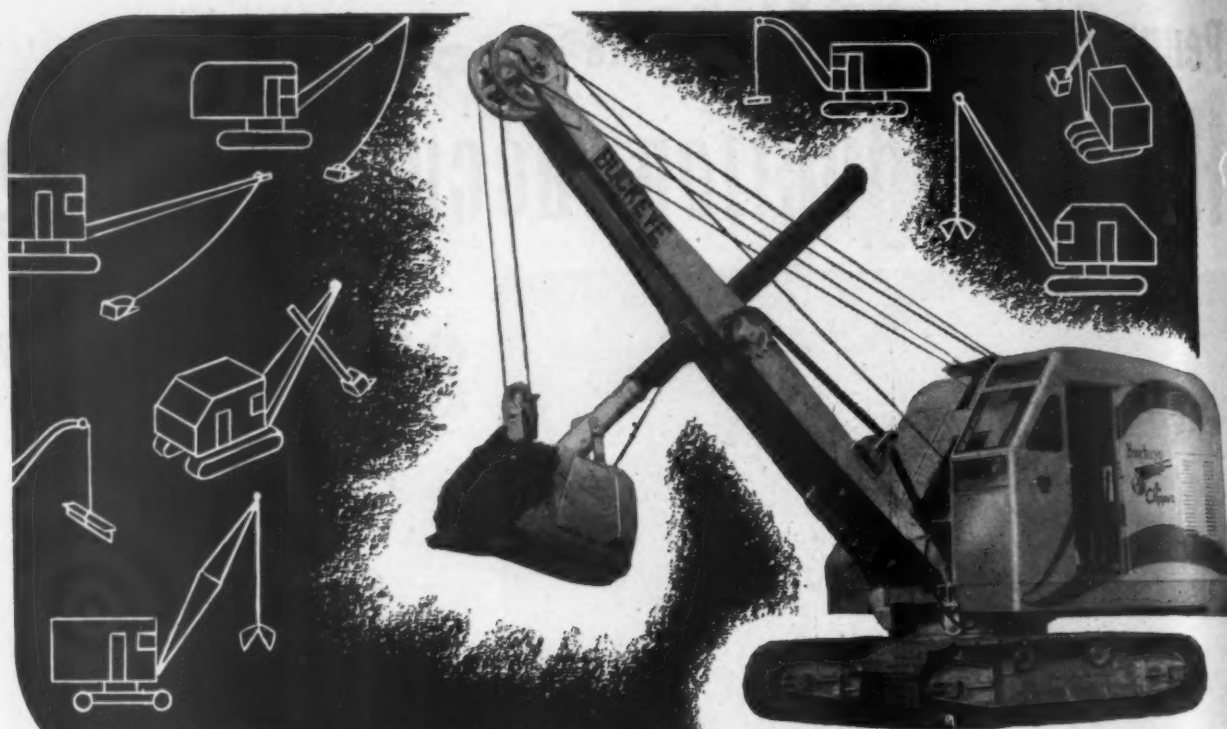
No matter what rope you want—no matter what grade, type, or size—you can get it with the Form-Set feature. Details are available through the nearest Bethlehem representative.



This is Form-Set rope. The strands have been lifted out by hand. Note how the wires lie smoothly in place. There is no inner tension to force them apart.

When you think WIRE ROPE . . . think BETHLEHEM





OUTSTANDING IN ITS CLASS!

Buckeye Clipper $\frac{1}{2}$ and $\frac{3}{4}$ yard convertible power shovels stand out in any comparison with other shovels of like size. They cut costs, handle smoother, dig faster, last longer.

CHECK THESE BUCKEYE CLIPPER FEATURES...

- "Mevac" Metered Vacuum Power Control, exclusive with Buckeye, gives operator better "feel"—makes brake and clutch linings wear longer—eliminates operator fatigue.
- Automatic Swing Brake
- 360° Swing
- Non-Clogging, Self-Cleaning Crawlers
- Automotive Type (Chainless) Drive
- Independent, Positive, Chain Crowd
- Even Weight Distribution
- Crowd, Swing and Hoist While Traveling
- Vacuum Power Control Dipper Trip

BUCKEYE DOZERS Are A Standout, Too

Buckeye Dozers and Trail-builders are outstanding in their field, too! Ruggedly built to stand severe service, they are noted for fast, smooth operation. They dig in and push bigger pay loads with less tractor effort. See your Buckeye dealer for detailed information.



The Buckeye Clipper's 24 points of superior design and construction, that save time and cut costs, are detailed in "The Age of the Clippers." Send for your copy today and learn how these rugged, easy-to-operate, readily convertible shovels can increase your output and lower costs.

BUCKEYE TRACTION DITCHER CO.

Findlay, Ohio



built by **Buckeye**
 CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
 TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

THE POWER THEY PROMISE IS THE POWER THEY DELIVER

CONSIDER this when you want to be sure you have enough crusher power: The horsepower of "Caterpillar" Diesel Engines is **ALL WORKPOWER**. Ratings show maximum output — not the momentary peak performance of a power-plant stripped of fan, pump and other necessary accessories.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS



The discharged veteran wears this emblem.
Remember his service and honor him.



"YOU CAN'T BEAT A 'CATERPILLAR' DIESEL in its weight and horsepower. No other make engine can operate any cheaper," says E. T. Busch, superintendent of this plant crushing extremely hard flint rock boulders. "Filters keep fuel clean as a hound's tooth," he adds.

A few of the many De Laval Worm Gear Reducers used in this plant

Driving a kiln feeder

**PRACTICALLY NO PARTS REPLACEMENTS
in 19 YEARS**

Reported by Plant Employing Many De Laval Worm Gear Speed Reducers

Driving a kiln

How's that for Reliability?

De Laval Worm Gear Speed Reducers have given such good service in a certain cement mill (name furnished on request) that the Plant Superintendent has written of their performance:

"There are about 175 reducers of various sizes in operation in this plant on a wide diversity of jobs; and during the last eighteen or nineteen years, since the original ones were installed, we have had to make practically no replacements of worms, wheels or bearings. In fact, there has never been any interruption in production by reason of the failure of a speed reducer."

For reliable, trouble-free service under severe conditions, specify De Laval Worm Gear Speed Reducers.

WORM GEAR DIVISION

DE LAVAL

STEAM TURBINE COMPANY - TRENTON 2, NEW JERSEY

BUILT TO BETTER YOUR COOLING

FULLER AIR-QUENCHING INCLINED-GRATE COOLER



The Fuller Air-Quenching Inclined-Grate Cooler was conceived, designed and built by engineers having years of experience in the cement industry. They knew the problems of the industry and what was needed. With this experience and knowledge they set out to build, not just another cooler, but one that would actually meet desired requirements in a highly satisfactory manner.

This determination has had its just reward, for over 125 coolers have now been sold, a great majority of which have already been put into operation.

This cooler has many outstanding qualities not to be found in any other cooler now being offered the industry. Bulletin CO-3 fully illustrates and describes various applications of the cooler, together with important advantages to be gained through the use of this equipment. Write for your copy now . . . it will be sent you promptly.

FULLER DRY PULVERIZED-MATERIAL COOLER

The Fuller Dry Pulverized-Material Cooler was developed and built primarily for the purpose of cooling finished Portland cement and to meet specifications of state highway departments and other users. Also for the elimination of difficulties encountered in storing and packing hot materials.

Installations have now been in successful operation over an extended period in the cement and chemical-process industries.

The cooler is simple in design, efficient, low in power consumption and maintenance. Each cooler unit is entirely independent of the other. One or more units may be shut down for inspection or repairs without affecting the operation of the other units. Internal mechanism is readily accessible.

Bulletin PMC-1 fully illustrates and describes this equipment. We'll be glad to send you a copy on request.



SEE OUR EXHIBIT
CHEMICAL SHOW
NEW YORK
FEB. 25-MAR. 2, INC.

FULLER COMPANY CATASAUQUA, PENNSYLVANIA

Chicago 3 · 120 So. LaSalle St.
San Francisco 4 · 421 Chancery Bldg.
Washington 5, D. C. · 618 Colorado Bldg.



FULLER-KINYON, FULLER-FLUXO AND THE AIRVEYOR CONVEYING SYSTEMS
ROTARY FEEDERS AND DISCHARGE GATES . . . ROTARY AIR COMPRESSORS
AND VACUUM PUMPS . . . AIR-QUENCHING INCLINED-GRATE COOLERS . . . DRY
PULVERIZED-MATERIAL COOLER . . . AERATION UNITS . . . MATERIAL-LEVEL
INDICATORS . . . MOTION SAFETY SWITCH . . . SLURRY VALVES . . . SAMPLERS

G-42

INDUSTRIAL RUBBER GOODS

A year of remarkable history has just passed, in which the normal routine way of living for most every individual in many countries of the world, was disturbed. Citizens everywhere were devoting their energies to war... to destroy, instead of to build.

... AND NOW IT IS PRODUCTION FOR PEACE



INDUSTRIAL RUBBER PRODUCTS that Quaker is making NOW for civilian use

(PARTIAL LIST ONLY)

Transmission Belting
Agricultural Belting
Conveyor Belting
Elevator Belting
Air Drill Hose
Chemical Hose
Creamery Hose
Fire Hose
Fuel Oil Hose
Garden Hose
Gasoline Hose
Tank Car and Tank Truck Hose
Sand Blast Hose
Spray Hose
Steam Hose
Suction Hose
Oil Suction and Discharge Hose
Water Hose
Road Contractors' Hose
Welding Hose
Tubing
Rod Packings
Sheet Packings
Gaskets
Washers
Pump Valves
Moulded Articles

This year is a fresh inspiration to guide us in peacetime endeavors. Quaker had no reconversion problem. The products of Industrial Rubber Goods which we manufacture are very similar, whether used for war industries or for peace industries. The paper work on cancellations of Government orders is just about completed. Full scale production on civilian orders started August 17 and has been going on steadily ever since.

Naturally we are making headway on our Backlog of orders. It still will be several months before critical raw materials will be available in quantities wanted. But we are making better deliveries on many items, especially on Fire Hose, Mill Hose and in Wrapped Construction Hose in sizes 3" and larger.

Our suggestion to the keen buyers, with an eye on the future, is to place their orders well in advance of requirements. This will insure getting your merchandise when desired.

Anticipate your needs on Industrial Rubber Products and send your orders to Quaker NOW.

"If there is a way to get it done—Quaker will do it"

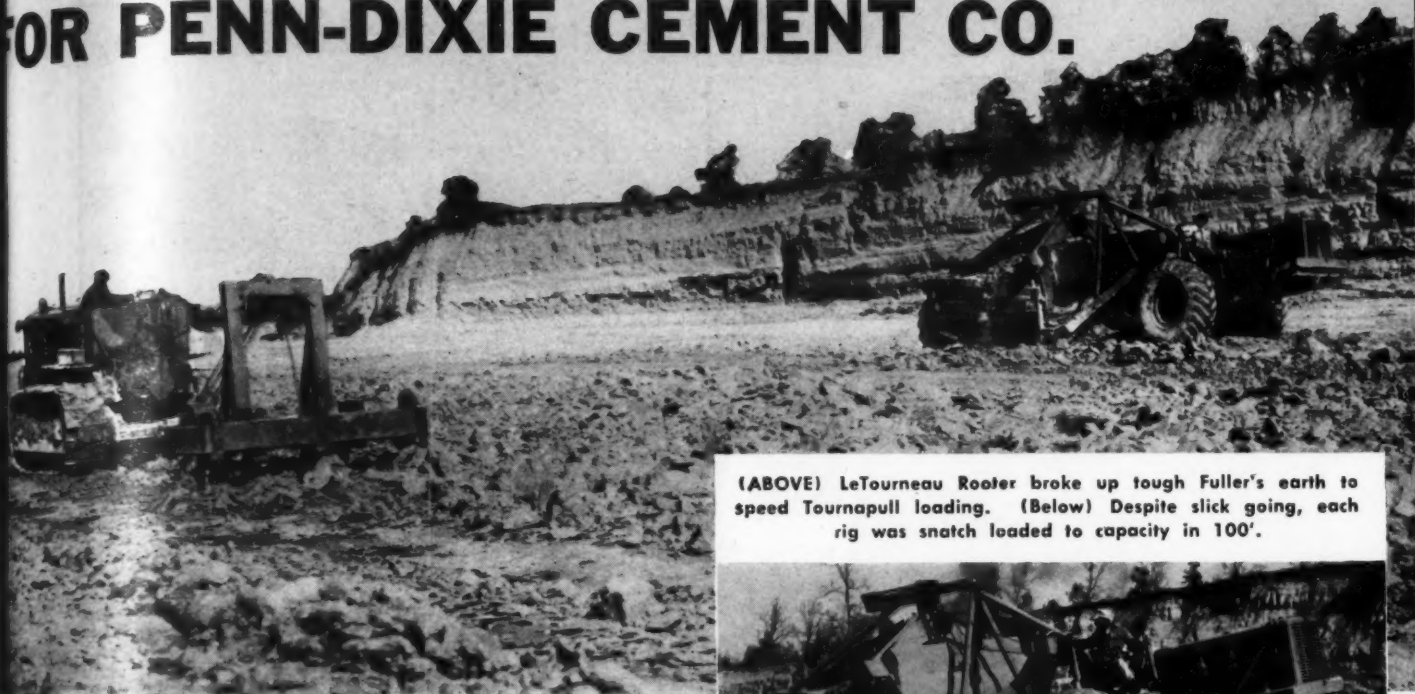
QUAKER RUBBER CORPORATION

PHILADELPHIA 24, PA.

NEW YORK 7 • CLEVELAND 15 • CHICAGO 16 • HOUSTON 1

Western Territory: QUAKER PACIFIC RUBBER COMPANY
SAN FRANCISCO 5 • LOS ANGELES 21

TOURNAPULLS STRIP 40' OVERBURDEN FOR PENN-DIXIE CEMENT CO.



(ABOVE) LeTourneau Rooter broke up tough Fuller's earth to speed Tournapull loading. (Below) Despite slick going, each rig was snatch loaded to capacity in 100'.



150,000 YARDS OF TOUGH MATERIAL MOVED WITH 4 VETERAN TOURNAPULL RIGS BY COFFEE CONSTRUCTION COMPANY

40' of overburden had to be removed from cement-rock strata at the Penn-Dixie Cement Co.'s Clinchfield, Georgia, pit. Coffee Construction Co. brought in a fleet of 4 Tournapulls, veterans of four years' steady use . . . with them, moved 150,000 yards on schedule.

Rooter Speeds Stripping of Tough Material

Working much of the time along 50 to 100' banks, the Tournapulls quickly cut down through top soil and Georgia red clay. Below the clay, Coffee Construction ran into rock, which was broken up with a LeTourneau Rooter and Dozed over the face into the pit. Next came Fuller's earth—slick and plenty tough. By breaking it up with the Rooter for easy Tournapull loading, Coffee Construction maintained the following Tournapull production:

Tournapulls Average 8 Trips Per Hour On 4200' Cycle

Working over 4200' cycles, each rig averaged a round trip every 7 minutes. Tournapull cycle time included loading the Fuller's earth, haul, spread in a mined-out area and return. By using a motor grader to maintain good haul roads, Coffee Construction took full advantage of fast Tournapull hauling speeds.

4 Years' Steady Use

Coffee Construction Co. knows Tournapulls' ability to deliver low-cost yardage with a minimum of maintenance. In spite of 4 years of hard and steady service in sand, muck, rock and red clay, some of these rigs still run on original drive tires. You'll find, too, that it will pay you to take advantage of Tournapulls' lowest-net-cost-per-yard on your stripping jobs. Ask your LeTourneau Distributor for facts and figures TODAY.

P010

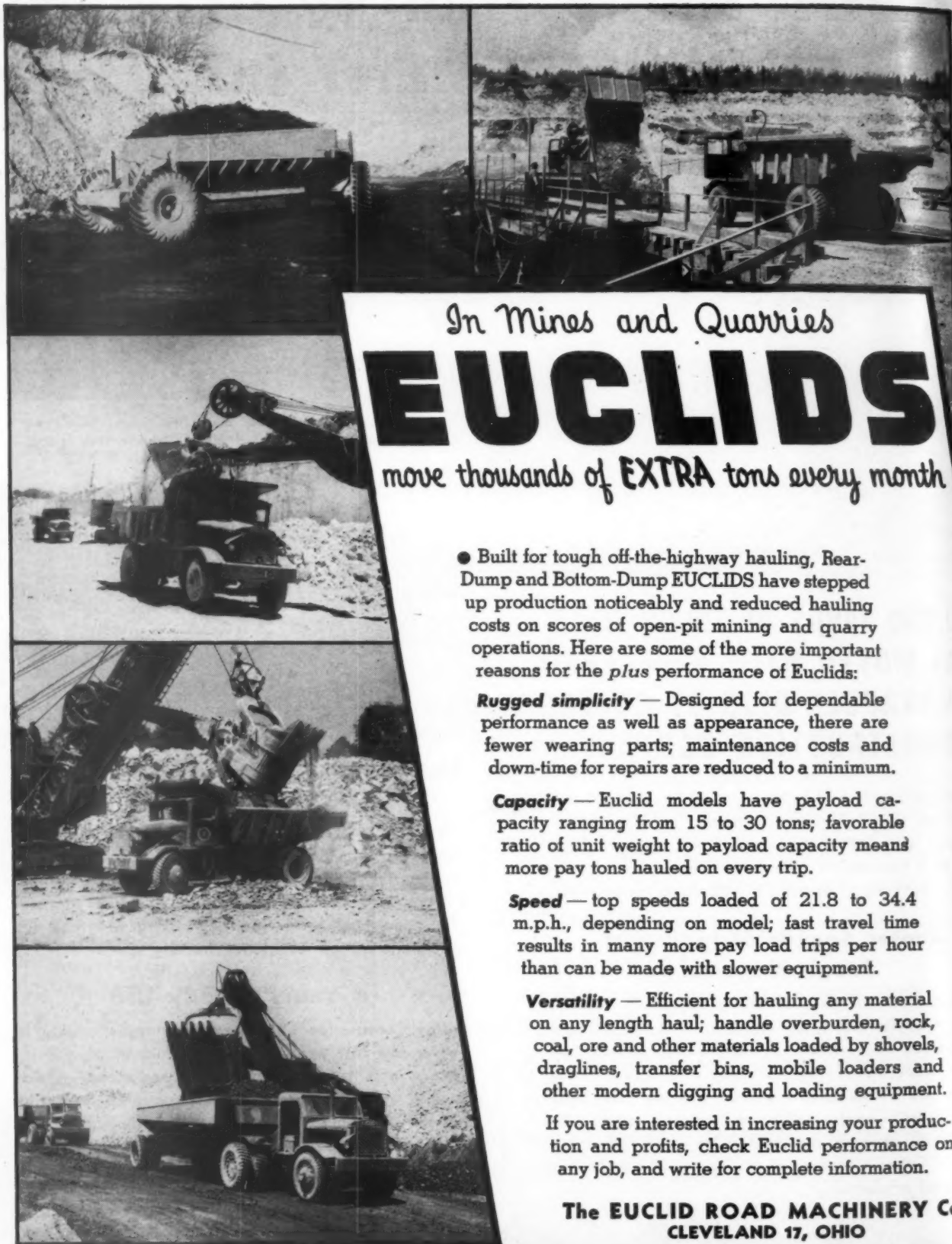
Tournapulls spread their loads on dump in mined-out area, 2,000' from the cut.

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA



TOURNAPULLS

* Trade Mark Reg. U.S. Pat. Off.



In Mines and Quarries

EUCLIDS

move thousands of **EXTRA** tons every month

- Built for tough off-the-highway hauling, Rear-Dump and Bottom-Dump EUCLIDS have stepped up production noticeably and reduced hauling costs on scores of open-pit mining and quarry operations. Here are some of the more important reasons for the *plus* performance of Euclids:

Rugged simplicity — Designed for dependable performance as well as appearance, there are fewer wearing parts; maintenance costs and down-time for repairs are reduced to a minimum.

Capacity — Euclid models have payload capacity ranging from 15 to 30 tons; favorable ratio of unit weight to payload capacity means more pay tons hauled on every trip.

Speed — top speeds loaded of 21.8 to 34.4 m.p.h., depending on model; fast travel time results in many more pay load trips per hour than can be made with slower equipment.

Versatility — Efficient for hauling any material on any length haul; handle overburden, rock, coal, ore and other materials loaded by shovels, draglines, transfer bins, mobile loaders and other modern digging and loading equipment.

If you are interested in increasing your production and profits, check Euclid performance on any job, and write for complete information.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO

EUCLID

SELF-POWERED
HAULING EQUIPMENT

For EARTH . . . ROCK . . . COAL . . . ORE



**THIS
ROCKBUSTER
BREAKS 24" to 30"
CUBES DOWN
TO 1" or UNDER
AT A RATE OF
200 to 300
T. P. H.**

**A PRIMARY AND SECONDARY
CRUSHING UNIT COMBINED**

A single pass through this giant swing hammer crusher makes "little ones" out of the "biggest ones" with record speed. The final product is cubical. Investigate.



THE JEFFREY

MANUFACTURING COMPANY

**ESTABLISHED
1877**



935-99 N. Fourth St., Columbus 14, Ohio

Baltimore 1	Chicago 1	Detroit 13	Milwaukee 11	St. Louis 3
Cincinnati 1	Cleveland 2	Hartford	New York 7	Salt Lake City 1
Evans 14	Cleveland 13	Houston 5	Philadelphia 3	Sarasota 3
San Jose 2	Denver 2	Houston 19	Pittsburgh 22	

Government-Owned SURPLUS STEEL

Reasonably priced for substitute uses

AVAILABLE NOW

**Terms to fit your
production budget**



Over 50,000 tons of hot rolled and cold finished carbon and alloy steel bars in rounds, squares, flats and hexagons, priced downward—for substitute uses.

Budget priced, these 50,000 tons consist of 25,000 tons of carbon and 25,000 tons of alloy H.R. & C.F. bars, in sizes to meet your immediate requirements.

In addition, there are 60,000 tons of carbon and alloy billets, blooms and slabs. These semi-finished products are also priced for quick delivery in meeting the demands for substitute uses. If you qualify for credit, terms may be arranged. For detailed specifications, grades, sizes, deliveries and F.O.B. prices, simply write, wire or phone the nearest RFC Agency listed below.

WHAT ARE YOUR REQUIREMENTS? — CHECK THIS LIST

- | | |
|--|--|
| 1. Carbon and Alloy Billets, Blooms, Slabs, Skelp, Rods, etc. <input type="checkbox"/> | 6. Wire and Wire Products, Carbon and Alloy, Wire Rope, Reinforcing Wire Mesh <input type="checkbox"/> |
| 2. Reinforcing Bars <input type="checkbox"/> | 7. Stainless Steel Sheets, Strips, Standard Types <input type="checkbox"/> |
| 3. Structural Steel Shapes <input type="checkbox"/> | 8. Iron and Steel Pipe, and Tubing—Valves and Fittings <input type="checkbox"/> |
| 4. H. R. & C. R. Sheets, Strip Steel, Carbon and Alloy <input type="checkbox"/> | 9. Mechanical Tubing, Carbon and Alloy <input type="checkbox"/> |
| 5. Plates—Tin Plate, Terne Plate, Black Plate <input type="checkbox"/> | |

Name

Firm

Address

VETERANS: To help you in purchasing surplus property from the RFC, a veterans' unit has been established in each of our Disposing Agencies.



RECONSTRUCTION FINANCE CORPORATION

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION

Agencies located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver • Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

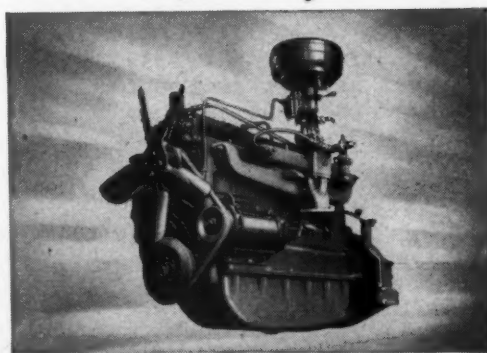
157-2



Ask G.I. Joe about GMC Pulling Power

On every battle front G.I. Joe saw proof of GMC's pulling power. In the South Pacific, in temperatures as high as 130 degrees, GMC "six-by-sixes" hauled huge loads through hub-deep mud and sand. In Europe, GMCs played the leading role on the famous Red Ball Express. In Alaska's ice and snow, Burma's jungles and Italy's mountain trails... wherever heavy loads were pulled through heavy going..., GMCs did the job.

G.I. Joe knows about GMC pulling power... and what he can tell you is mightily important to truck buyers. For GMC commercial models, 1/2 to 20 tons, have engines of the same basic design as their military brothers. They offer the civilian counterpart of the power, performance and stamina demonstrated by nearly 600,000 GMC "Army Workhorses."



The famous "270" engine, power plant of the "Army's Workhorse," also powers GMC models in the 3-ton range. All other GMC gasoline engines are of the same basic, war-proved design.

THE TRUCK OF VALUE



GASOLINE • DIESEL

GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION

ROCK PRODUCTS. February, 1946

Generally Speaking

Not more than 500,000 housing units can possibly be completed in 1946, according to latest estimates of the building industry and prospective new home owners will have to expect costs at least 35 percent higher than they were as of August, 1939.

* * * * *

The effect of the recently-imposed priorities, favoring construction of homes costing \$10,000 or less, over higher-priced residences, will be to retard industrial and commercial construction but not to halt it.

* * * * *

New construction in 1946 will better the 1945 volume by almost 60 percent and will represent the highest volume since 1929; excluding the war years, says the Department of Commerce. An annual rate of 9 billion dollars worth of building will be reached by the end of 1946, heading for a 12 million dollar volume in 1947. It is a healthy situation that 75 percent will be privately financed.

* * * * *

Indiana's State Highway Department has a \$100,000,000 five-year road building program; New York State has a public works potential of \$1,150,000,-000 and Pennsylvania has \$1,432,000,000 worth of public works under consideration. These figures serve to emphasize the pent-up demands developing over the country for new construction.

* * * * *

Civilian airport facilities will have to be provided if the common man is soon to become a flyer. A forerunner of what may come has been set up at Holman Field, St. Paul, Minn. There, a garage, filling station, conversion center and repair depot are being organized for civilian planes.

* * * * *

A potato dealer in Idaho is using ashes from the crater of an extinct volcano to insulate potato cellars. The light, porous ashes are poured between double sidewalls, suggesting new market possibilities for commercial lightweight aggregates.

* * * * *

Unless the price Control Act is extended beyond June 30, 1946, authority to control wages will end. While no ceilings are imposed on wages by government, there is a prohibition against wage cutting at stake.

* * * * *

It is possible to discharge an employee who campaigns in favor of a rival union when the employer has a closed-shop contract without violating the Wagner Act, if the contract has a long period to run. The National Labor Relations Board has held that one such discharge was permissible.

* * * * *

Congress will be asked for a full year's extension of price control to carry it to June 30, 1947, and likely will grant it, but in modified form to not discourage production. One thing is certain--if prices threaten to get out of control, OPA stands a strong chance to be reinstated.

* * * * *

To illustrate how labor is hurting its own cause by strikes and its extravagant demands, Gov. M. C. Wallgren, liberal Democratic Governor of Washington, recently stated that he was not in favor of capital construction at present-day costs. The State, he said, cannot undertake its building program if prices continue to be prohibitive, for it must get a dollar's value for each dollar of cost.

* * * * *

Information on German industrial and scientific developments may be obtained from 71 additional reports being made public by the Department of Commerce.

* * * * *

(Continued on page 47)



ROTARY KILNS

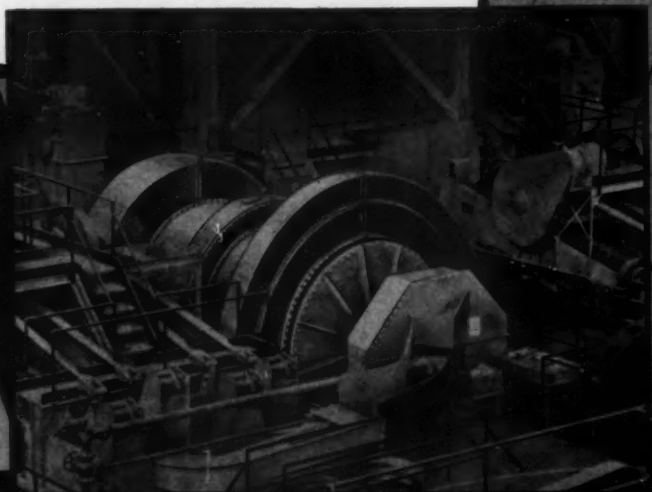
ROTARY KILNS

For sintering, nodulizing, calcining, desulphurizing and oxidizing and reducing roasting—also coolers, pre-coolers, preheaters, recuperators—and their accessories.

GRINDING MILLS

Ballmills, tubemills and multi-compartment mills—wet or dry grinding—open or closed circuit—also air swept for grinding and drying.

GRINDING MILLS



F. L. SMIDTH & CO.

11 WEST 42nd ST.

ENGINEERS AND
MACHINERY MANUFACTURERS

NEW YORK, N. Y.

Thermoid

—For Progress in Many American Industries



from the Bettman Archive

In 1870, before the introduction of labor-saving, time-saving, modern equipment, excavation work was tedious and slow.



A modern jack-hammer crew gets things done in a hurry with Thermoid Air Hose.

YOUR business may never use air hose. Nevertheless, it should interest you to know that Thermoid has developed air hose that stands up better against heat and oil... to pulsating pressure... to cuts and bruises... to the abrasion of being dragged over jagged rocks.

Thermoid's leadership in producing superior air hose is typical of Thermoid's leadership since 1880, in the design and manufacture of all kinds of hose and belting for power transmission and materials handling. Consultation with a Thermoid representative may develop ways to help you improve processes and reduce costs. *It's good business to do business with Thermoid.*

THE THERMOID LINE INCLUDES: Transmission Belting • F.H.P. and Multiple V-Belts and Drives • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Sheet Packings • Industrial Brake Linings and Friction Products • Molded Hard Rubber and Plastic Products.

Thermoid Rubber

DIVISION OF THERMOID COMPANY
TRENTON 4, NEW JERSEY

GENERALLY SPEAKING

(Continued from page 44)

New controls over home building will have the effect that suppliers of materials will be compelled to honor the demands of priority holders for materials before selling to others - for homes costing \$10,000 or less. Higher-priced homes will have to be constructed of materials for which the builder has fought in competition with other builders who have no priorities.

* * * * *

St. Louis has set up city-wide labor-management collective bargaining and dispute settlement machinery through a six-year, no-strike agreement signed by laundry and dry cleaning firms and representatives of three A. F. of L. unions. A three-man arbitration commission settles disputes and wage issues and is empowered to review, at two-year intervals, the wage scales of companies included. Might be a solution for other industries, if it proves workable.

* * * * *

A new industry is being built on phosphates, according to Paul Logue of Monsanto Chemical Co. Increased use is being made of phosphates in food manufacture, plastics, textiles, soap-making and the metal and petroleum industries. Flame-retarding properties of new phosphorus compounds make them of particular value in the manufacture of plastics.

* * * * *

DC996 Silicone, a heat-stable waterproof varnish developed by Dow Corning Corp., said to have the high order of thermal stability and the retention of waterproofness characteristic of silicone insulation, is now commercially available for the windings of electrical equipment. Greater protection against failures from overloads, increased service life of insulation, higher permissible operating temperatures, greater fire protection and increased protection against excessive moisture are advantages claimed for this product, which has as its origin silica.

* * * * *

Only about 25 percent of the new homes begun in recent months are insured by FHA according to a report by the Housing Institute, from New York, N. Y. Large down payments by buyers have reduced the risks and lending institutions are getting the bulk.

* * * * *

Portland Cement Association has resumed its national magazine advertising program featuring concrete masonry houses. Advertisements will appear in leading home magazines with a circulation close to 6,000,000, and will bring in the suggestion that prospective home builders contact local concrete masonry manufacturers.

* * * * *

Wages of employees cannot safely be raised just before a collective-bargaining election in a plant. It was held by the New York State Labor Relations Board that an employer interfered with an election by announcing wage increases even though it was done in good faith.

* * * * *

Something has to be done to encourage more engineers to enter the highway engineering field if highway construction is to achieve the required volume. Because of the war and its effects the number of highway engineers has been reduced by 50 percent.

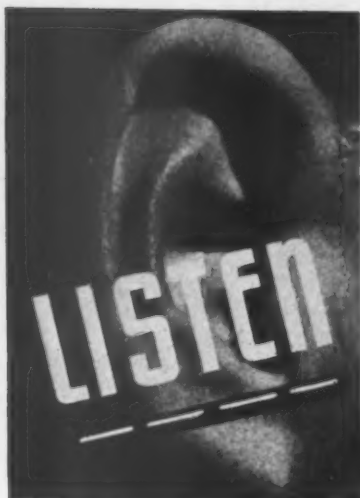
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Kaiser Community Homes, Inc., reportedly is starting to build the first of its mass production home units in San Jose.

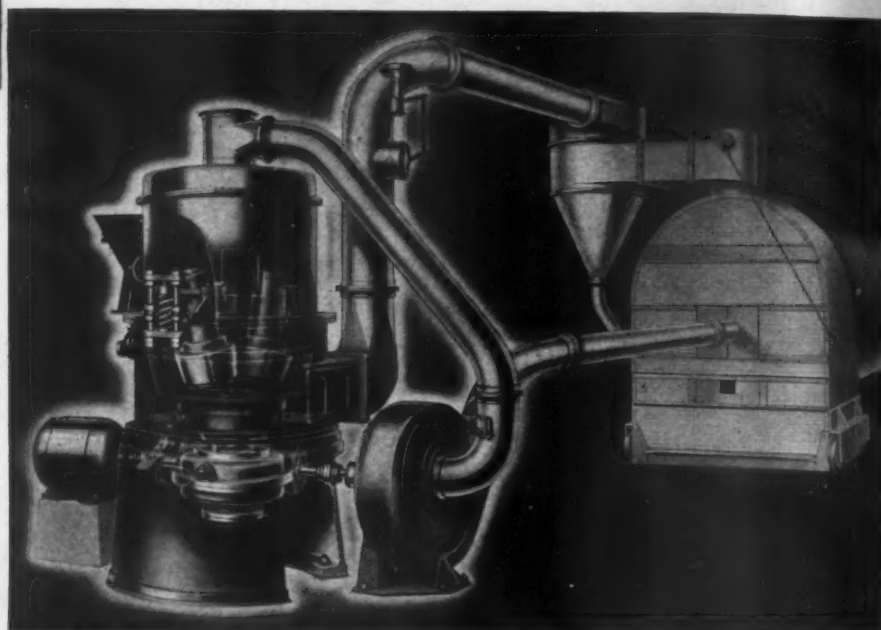
* * * * *

An employer cannot usually be held to have interfered with the rights of his employees under the Wagner Act because of anti-union statements made by supervisors to subordinate foremen.

* * * * *



.....and try to hear the BOWL MILL



The Raymond BOWL MILL

... runs so smoothly and quietly that you can hardly tell it is operating except by the whirr of the motor or the rotation of the drive shaft.

It runs so free of vibration that a coin ... balanced on the top plate of the mill ... will remain standing on edge while the machine is pulverizing.

All this points to the finely engineered construction of the Bowl Mill ... worm gear drive, precision shafts and bearings, automatic lubrication, balanced rotating bowl, and absence of metal-to-metal contact between the grinding surfaces.

For long-term over-all economy, install the Bowl Mill for direct-firing cement, lime and dolomite kilns or industrial furnaces.

It handles any grade or moisture coal ... has thermostatic control ... easy 3-point control of fineness ... adjustable for wear ... automatic tramp iron disposal.

See Raymond Catalog
No. 43 for details of the
BOWL MILL.

RAYMOND PULVERIZER DIVISION

COMBUSTION ENGINEERING COMPANY, INC.

1307 North Branch Street

CHICAGO

Sales Offices in Principal Cities - In Canada, Combustion Engineering Corporation, Ltd., Montreal

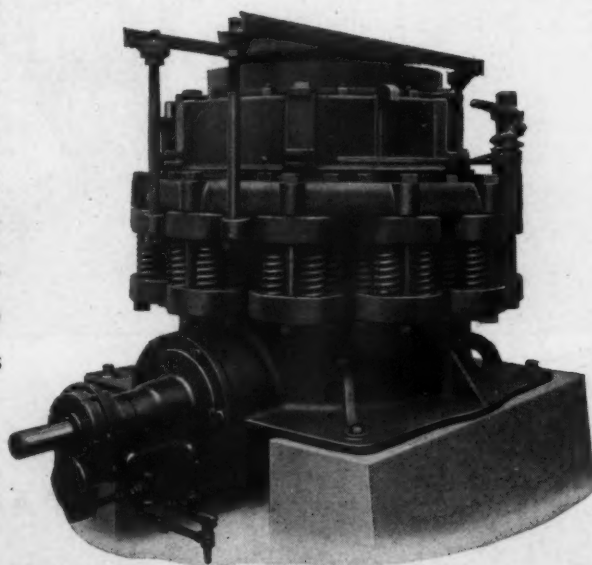




The building of new, modern highways and the rebuilding of those that are old and worn out will have a prominent place in postwar construction. This will require a tremendous quantity of crushed materials, particularly the finer sizes as are used for highways of the bituminous type. The Symons Cone is ideally suited for producing such materials. For quantity, low cost production, follow the example set by the leaders of the crushed materials industry — use Symons Cones.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN

NEW YORK • LOS ANGELES • LONDON • TORONTO • JOHANNESBURG



SYMONS CONE CRUSHERS

Why a **Bucket Loader** Loads faster from Stock Piles

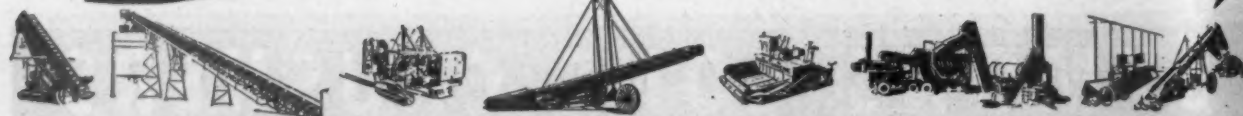
• Barber-Greene Bucket Loaders are designed specifically for picking up material from stock piles and loading to trucks or processing equipment faster and cheaper than any other method.

Continuous, powerful crowding speeds—plus spiral feeding on the front end—loads every bucket to the maximum, thus maintaining peak capacity throughout the day. There is no problem of operator efficiency; he merely keeps the machine to the working face. Clean pickup eliminates accessory equipment and excessive hand shoveling. Capacities of $1\frac{1}{2}$ to 3 cubic yards per minute produce high tonnage per hour.

The Barber-Greene Catalog No. 82 illustrates and describes the various Bucket Loaders that will best meet your particular material handling problem. Barber-Greene Company, Aurora, Illinois.



CONSTANT FLOW EQUIPMENT



LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES



Pioneer Rock Crushing Plant, owned by E. P. Brady, Detroit, Michigan, powered by Murphy Diesel ME-6 Industrial Power Unit . . . a full Diesel engine, $5\frac{3}{4} \times 6\frac{1}{4}$ ", 6-cyl., 135 HP continuous, 160 HP intermittent . . . mounted on motor truck chassis.

DEPENDABLE *Wherever* POWER *is Needed*

CONSTRUCTION has the "green light" . . . vast projects are getting the "go ahead" . . . it's time to equip with dependable power.

As portable or stationary power plants . . . singly or in multiple unit hook-ups . . . MURPHY DIESELS deliver more power, more profit on even the toughest of construction jobs. These rugged engines are simple to operate and main-

tain . . . they stay on the job, deliver more power at low-cost, and are economical in maintenance cost.

Because they are so compact, relatively light in weight, and efficient in heavy-duty service, they are ideally adaptable to all types of portable construction equipment or stationary power plants. . . Write for bulletin.

★ Buy U. S. War Bonds ★

MURPHY DIESEL COMPANY
5315 W. Burnham St., Milwaukee 14, Wis.

More Power

**MURPHY
DIESEL**
Reg. U.S. Pat. Off.

More Profit

*Engines: FROM 90 to 215 HP
Generators: FROM 60 to 115 KW*

"FIELD-PROVEN Power"

108

THERE'S NOTHING TOUGHER THAN A "DIAMOND"



TIME SAVING—PROFIT MAKING EQUIPMENT

For more profits and for greater operating efficiency in 1946, "see the DIAMOND dealer" nearest you, or write us.

"There's nothing tougher than a DIAMOND" has been proven over and over by users of the DIAMOND equipment shown above. Profits in the rock, sand and gravel business are dependent upon large production of uniformly high quality, a minimum of cost and time out for repair, and low operating costs. DIAMOND equipment is famous for exactly this performance. You pay no more, and look what you get!



DIAMOND IRON WORKS, INC.
AND THE MAHR MANUFACTURING CO. DIVISION

1800 SECOND STREET NORTH

MINNEAPOLIS 11, MINNESOTA



Pre-Treated For Shock

Maximum shock resistance is assured for this shovel by two simple facts. One is that rolled alloy steel excels in toughness under recurring impact. Fact two is that all-welded, deep box-section construction is the strongest design principle known.

The new P&H Electric Shovel combines these advantages to the finest degree in both upper and lower frames. Shocks and stresses encountered with every working motion are dissipated before they can reach vital mechanical parts. Design throughout is greatly simplified.

The boom, car body, and revolving frame of a P&H, for example, are welded into completely integral units with the right metal in the right place. All the weight in all parts is live working weight.

The greater rigidity of welded alloy steel prevents weaving, keeps the machinery in line.

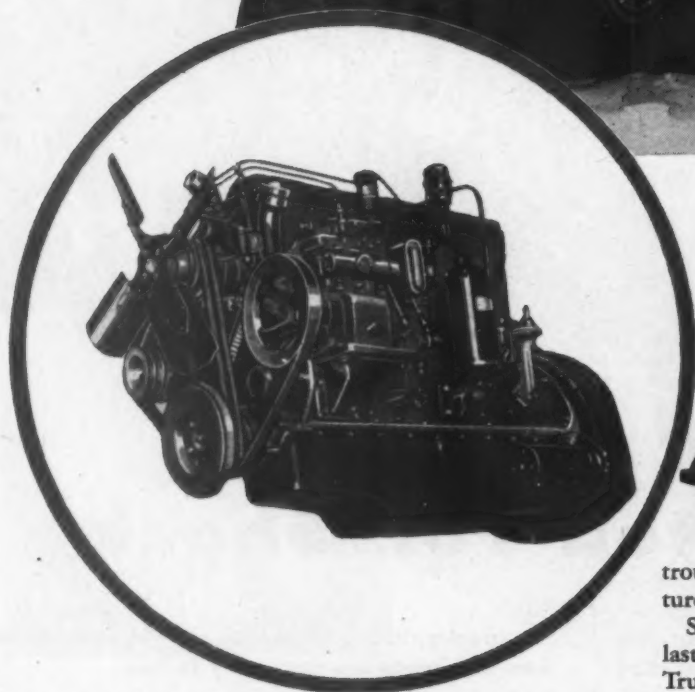
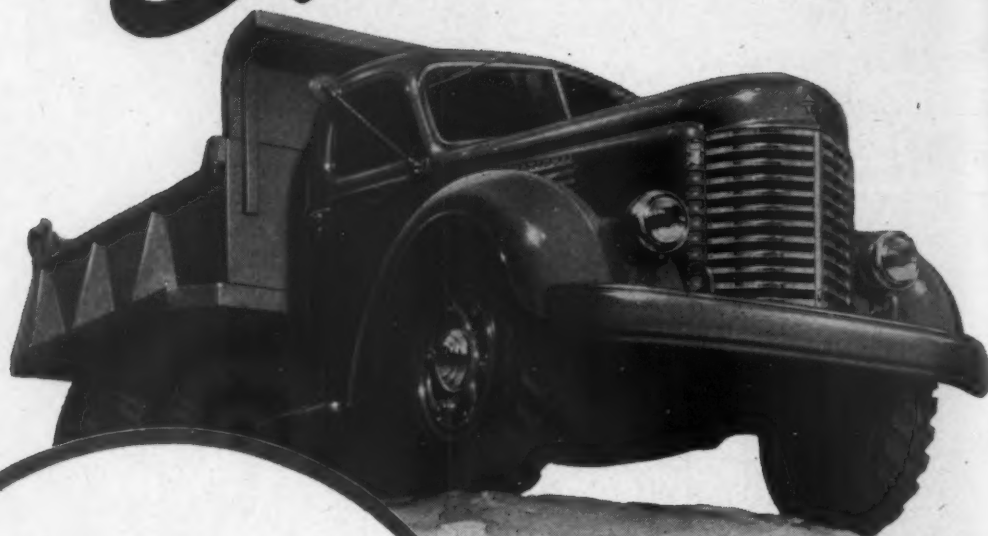
Here's a typical P&H contribution in the interest of lower digging costs in open pits. The new P&H Electric Shovels embody many other equally important developments you should know about. Write for Bulletin X-83.



THE GREATEST FORWARD STEP EVER MADE IN ELECTRIC SHOVEL DEVELOPMENT

TRUCK

Stamina



● More stamina and power. That's what today's International Trucks deliver.

Note the International Red Diamond Engine in the picture. This famous engine powers the bigger Internationals. Now has longer life, because of greater strength, as well as added power.

Improvements have been made in International Truck Chassis, too—improvements to step up even further the economy, ease of operation and long,

**FOR TOUGH
TRANSPORT**



trouble-free service that are the outstanding features of International Truck performance.

So outstanding is this performance that in the last fourteen years more heavy-duty International Trucks have been sold than any other make.

The International Truck Line is a complete line, with a truck of the right size and carrying capacity for every job. And back of every truck are these top service facilities—a network of International Truck Dealers and a system of International Truck Branches that form the nation's largest company-owned truck service organization.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois



LISTEN TO "HARVEST OF STARS" EVERY SUNDAY! NBC NETWORK



INTERNATIONAL Trucks

★ \$1,000,000,000

construction program
now getting under way

**... ARE YOU READY
WITH REAL PROFIT EARNING EQUIPMENT
to successfully compete for
your share of this business?**

You'll need fast, rugged, economical-to-operate machines — like up-to-the-minute MICHIGAN Mobile SHOVELS-CRANES. They can be relied upon to stay on the job day after day with a minimum of maintenance or repair — they've proven it on scores of tough civilian and military jobs the world over...

IT WILL PAY YOU TO INVESTIGATE
these profit-earning advantages of
MICHIGAN Mobile SHOVELS-CRANES
— write today for data and specifications in Bulletin RP-26.

$\frac{3}{8}$ yard and $\frac{1}{2}$ yard
Shovels — convertible
to crane, clamshell,
dragline, trench-hoe.

6, 10 and 12 ton
CRANES
FINGER TIP
AIR CONTROLS

★ WPB estimate for 1946

MICHIGAN

POWER SHOVEL COMPANY

BENTON HARBOR, MICHIGAN

ROCK PRODUCTS, February, 1946



"Tell me Bill . . . How did the Taylor Spiral Pipe come through?"

It's been coming through with laurels for more than forty years!

Those who know Taylor Spiral Pipe well, never cease to marvel at the rugged strength it possesses despite its light wall thickness. And there is good reason to marvel; for by any test it is the strongest type of pipe made.

A 12-inch, 12-gauge length of Taylor Spiral was not crushed or perceptibly distorted by a 9-ton load. A 20-foot length of 12-inch, 10-gauge pipe, supported only at its center, did not buckle under a load of nearly five tons supported from its extreme ends. A 12-inch, 12-gauge pipe has a bursting strength up around 900 lbs. per sq. in. So on all counts Taylor Spiral has greater strength than any other type of pipe of equal wall thickness.

But too many pipe users fail to recognize this, or at least fail to do anything about it. For every service that doesn't call for heavier pipe they continue to use Standard Thickness as though it represented the low point on the scale of available pipe thicknesses—as though light-but-strong Taylor Spiral were not available.

The fact is that Taylor Spiral Pipe has proved in hundreds of installations its ability to handle a large percentage of the everyday piping requirements ordinarily assigned to Standard Thickness pipe. When used for services like those listed below its light weight saves money at every turn—cuts initial cost, shipping cost, erection cost, cost of supporting structures. In many cases the installed cost of Taylor Spiral Pipe is only about half that of the Standard Thickness pipe it so adequately replaces.

Taylor Spiral for services like those listed below is made practical by the range of sizes and variety of fittings. Thicknesses range from 12 to 6 gauge; sizes from 6" to 42"; joint lengths up to 40 ft. All types of end joints and couplings, all kinds of fittings and specials or fabricated assemblies, are produced by Taylor Forge, assuring a complete service and undivided responsibility.

TAYLOR FORGE & PIPE WORKS

General Offices & Works: Chicago, P. O. Box 485 ★ New York Office: 50 Church St. ★ Philadelphia Office: Broad Street Station Bldg.

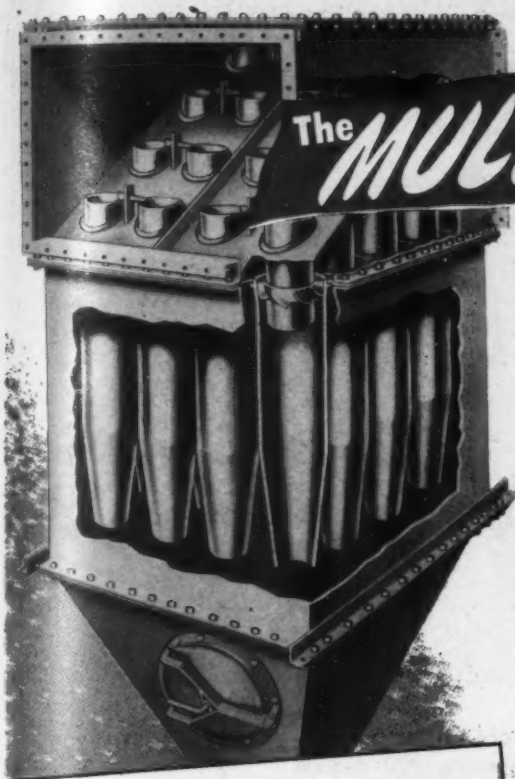


CHANGE TO TAYLOR SPIRAL PIPE FOR:

- High and Low Pressure Water Lines
- Low Pressure Steam and Air Lines
- Steam and Diesel Exhaust Lines
- Vacuum and Suction Lines
- Blower Piping
- Sand and Gravel Lines
- Industrial Gas Lines
- Oil and Gas Gathering Lines
- Swing Pipe
- Spray Pond Piping
- Hydraulic Mining
- Dredge Lines

There's a difference between *Compactness* and *Space Adaptability*...

The **MULTICLONE** has BOTH!



IN SELECTING dust recovery equipment, every foot of space saved is that much more valuable area available for other equipment. And the *compactness* of the equipment you select is just one of several ways to save plant space. Equally important is the *adaptability* of the equipment to space limitations within an existing plant.

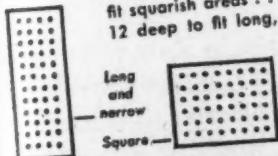
And this is how the Multiclone makes two-way savings in space. For the Multiclone unit itself is not only more compact than other equipment of comparable performance (see chart), but it is highly adaptable to a wide range of space limitations—to low headroom, to restricted side clearances, and even to fitting into narrow or odd-shaped areas that would otherwise be waste space.

HERE'S WHAT WE MEAN:

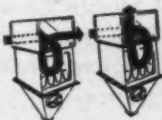
The Multiclone itself is unusually compact, requiring as little as 1/6 the floor space, 1/4 the cubic space of other units of comparable performance!

Make	Relative Space Requirements	
	In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	3.9	3.2
Collector C	6.8	3.9

... Also Its Shape is highly adaptable to various space requirements. For example, a 48 tube unit can be made 6 tubes wide by 8 tubes deep to fit squarish areas . . . or 4 tubes wide by 12 deep to fit long, narrow spaces. And inlets or outlets can be across either the wide or narrow faces—whichever is most convenient!



... And Its Duct Connections can also be varied to meet space limitations. For low headroom, a side-inlet side-outlet installation is generally best. But where side clearances are restricted, a side-inlet top-outlet installation can readily be made with the Multiclone. And even other arrangements are possible when necessary!



These are only typical of still other space-savings the Multiclone can make in your plant, whether your installation is in a new structure or for modernizing existing equipment. Let our experienced engineers give you all the facts and make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearby office places this assistance at your service!

For this reason, you can fit the Multiclone into unbelievably small spaces—out-of-the-way areas behind or beneath other equipment. And saving valuable space is just one of many Multiclone advantages . . . The cleaning efficiency of its small tubes (made possible by the patented *vane* construction) is such that it recovers not only large, medium and small particles, but also a high percentage of the very small particles of 10 microns and less. • It has no high speed moving parts, no screens, nothing to require frequent servicing, repair or replacement. • Its single inlet and outlet ducts greatly simplify installation, insulation and maintenance . . . These and still other Multiclone advantages are outlined in this booklet. Send for your copy today!



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Announcing the New

Norblo

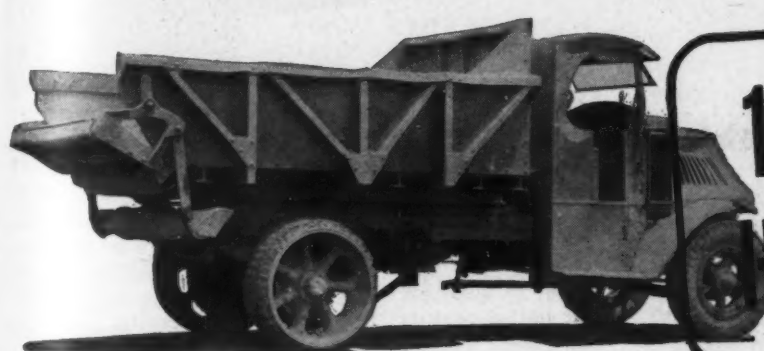
Cement Cooler

This new Norblo product combines air cooling and dust collection, reducing the temperature of cement to 200 degrees or lower. It can also be attached to existing air separators to add cooling of both fines and tailings. With the Norblo Cement Cooler you clean up the entire milling process, get the most advanced cooling wholly by air, whether you use air separators or other methods.

Norblo Cement Cooling is fully patented. It links a revolutionary advance and a long desired solution of one of the thorniest problems in cement mill operation.

With the Norblo Automatic Bag Type Collectors, Norblo H. E. L. S. Cyclones and Norblo Hydraulic Collectors, Norblo Exhaust Fans, Norblo equipment for bag cleaning, etc., the addition of Norblo Cement Coolers makes Norblo the most complete line of dust collecting and air handling equipment now available for the cement, lime, gypsum, phosphate and other rock products industries in North and South America.

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HARD LABOR!**

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Loaded by steamshovel, these trucks haul capacity loads from quarry to crusher, a distance of 1,500 feet, on an average of 25 times a day.

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delivery. The third, an old 7½-ton Mack, has been on the job since 1929. Sixteen years at hard labor on the rockpile and still going strong!

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You'll be asked to supply materials for the greatest construction boom America has ever seen. That leaves only a little while before Spring to streamline and modernize your plant so that you will be in a position to supply the heavy demands that will be made on your productive capacity . . . and to supply those demands at a profit.

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For half a century, Robins Job-Engineering has been recognized as the outstanding service in all phases of design and manufacture for bulk materials handling machinery. And 41 Robins-pioneered "firsts" are evidence of the advantages you can gain from Job-Engineering.

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DIVISION OF HEWITT RUBBER CORPORATION



Editor's Page

Economic Facts of Life

WHATEVER written agreements are forthcoming from conferences between management and labor, we may be fairly certain of one thing. They will merely be stop-gaps—temporary truces—that will yield to industrial flare-ups all over again when and if conditions again become ripe. No one seems to know the solution in the tussle for higher wages under restricted price conditions. An expedient will be adopted, for something must be done, but it seems that some long-range program can be evolved to minimize the likelihood of costly repetition of strikes and unproductive work performance in years to come. Whatever is needed may take years to perfect, but wouldn't it be worth it?

Call it human engineering or human relations or public relations, or some other modern term that sounds appropriate, labor needs more attention from management. Companies that want to be fair with labor, and most do despite some of the accusations by irresponsible union leaders, might find a policy of letting labor in on some of the facts of running a business profitably in building good will that will endure. A little insight to the economic facts of life wouldn't hurt, for lack of understanding in the minds of working people is responsible for much of today's industrial strife. A better-informed class of workers would be more disposed to reason things out for themselves and less likely to develop distrust. Maybe companies have been slovenly in their relations to labor even though unintentionally so.

Workers cannot be expected to understand all there is to know about economics—the big shot economists don't always know their practicable applications—but certain fundamental facts about wages, costs and prices should be more widely understood. A greater understanding of how business is done, by more people over a period of years might have prevented the current exploitation of "differences" in the point of view between labor and management.

Let Labor Have the Facts

There are differences in viewpoint between the two but not of a kind that makes for strife. Management is sales and cost conscious while the worker is simply job conscious. Theoretically they are the same. If the worker could see, or be shown, with definiteness that lower prices and more sales are part and parcel of job security and if he understood the direct relationship between lower cost and creation of jobs some of his opposition to improved efficiency would be lessened.

But workers are individuals and, like all the rest of us, they take things personally. If the job-making

arguments for plant improvements are unconvincing to him, a worker very readily will suspect his own job is endangered. Management is confronted with a job of selling its policies to the workers; otherwise a barrier of mistrust and suspicion starts to build which lays the groundwork for organized activity in open opposition to management.

Effort directed toward a never-ending job of creating and maintaining good relations seems a reasonable approach. Then there would be more likelihood, in any conference between management and labor, that each party will believe that the other believes both are seeking the same goal of increased production and a higher standard of living through a system of free enterprise and collective bargaining. Then there would be chance for agreement.

Lack of Knowledge Is Dangerous

Lack of information easily could be dangerous. For example, it wouldn't be difficult to convince the uninformed that industry could raise wages by 24 percent without any price increase, only because of the elimination of excess profits taxes, overtime pay and incentive pay. That was implied recently by some government economists in an analysis of industry savings to be gained.

But, it isn't generally understood that "excess profits" mean profits above the prewar level, coming from the production of war materials when the federal government was the only customer, and taxes and borrowed money paid the bill. If excess profits existed it was because too much money was paid for the materials purchased.

Furthermore, excess profits during the war were made on the production of war materials, chiefly manufactured goods, and not on the production of peacetime goods. From here on there will be very little excess profits, so there will be no saving to industry in the repeal of excess profits taxes. The point that must be put across by industry is that any agreement on wage increases based upon the philosophy of ability to pay must be on the premise of looking into the future—what is to come—and not on what prevailed last year. That's where uncertainty enters the picture and why wage increases must follow proportionate increases in productivity. Human relations need close attention.

Bror Nordberg

If you needed

A MILLION DOLLARS

COULD YOU RAISE IT IN
LESS THAN 30 MINUTES?

A contracting firm had bid successfully on a large construction job. They realized that yesterday's methods would not meet today's needs . . . new equipment would be needed to handle the job . . . and the investment would total over a million dollars.

This well-financed company decided that it would be an advantage to borrow this money and amortize the loan over many months . . . let the new equipment pay for itself . . . leave their working capital unimpaired for supplies, payrolls, operating.

The details were laid before C.I.T. and . . . **IN LESS THAN THIRTY MINUTES** all arrangements were completed for a loan of over a million dollars! Of course it isn't always possible, under all circumstances, to arrange a loan in such a short time. However, the celerity with which this transaction was handled is typical of C.I.T. business methods.

This case history is not unusual. C.I.T. has made similar loans to industry . . . often on short notice . . . with repayment terms which retire the obligation over periods of months or years. C.I.T. is prepared to arrange financing in large or small amounts to fit the needs of almost any business.

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Any sound business can readily obtain working capital from C.I.T. Thousands or millions, **AT LOW COST**, and with a minimum of negotiation. Industry is invited to use our resources as an aid to better business.

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Rocky's NOTES

An Essay as Clairvoyant

A FRIEND in the rock products machinery business suggests that I discuss the problem of pricing capital goods for sale to producers in these industries—with an eye on the crystal ball to predict what's coming.

How long will price controls last? At present all standard equipment is still sold under O.P.A. price ceilings. Asked to quote on a machine or piece of equipment for delivery, say next April, the manufacturer may estimate his increased cost, and hence increased selling price, and apply to O.P.A. for authorization of that price. In the meantime he may quote his increased price to his customer. It may be a long time before O.P.A. gets down to his request, and then it may not be allowed, in which case the manufacturer is stuck if he goes through with filling the order. A piece of equipment for delivery next April will probably be manufactured next March or April. Who now can estimate costs two or three months ahead?

Our guess is that price controls on most capital goods (with possible exception of some building materials) will expire next June 30. They affect directly relatively few voters and hence are not politically significant in a Congressional election year. Price controls on many consumer goods will probably be continued because they are of much political significance.

How much more will machinery and equipment prices be? Probably the prices of machinery and equipment used in the rock products industry will increase over 1941 prices something like 60 to 75 percent.

Why so much rise? With labor rates advancing perhaps 15 to 20 percent and steel prices perhaps 10 to 15 percent, why so much price increase in special machinery? The answer is that these elemental costs are compounded or accumulative in the manufacture of many capital goods. Very few manufacturers make all the parts or accessories of their particular machines. They have to purchase from other manufacturers such things as motors, bearings, couplings, etc. Thus they are compelled to pay not only the increased

costs of raw material and labor in their own plants, but also those of suppliers.

Another reason for a sizable increase in price quotations on machinery and equipment is the decreased efficiency of labor which is always manifest in times of unrest and confusion. It is an unknown and unpredictable cost factor, especially so since responsible C.I.O. labor leaders say that any wage increase of less than 30 percent, which may be accepted, will mean merely a pause in the demand for an ultimate 30 percent. It is said a contract with a labor union today means absolutely nothing, so far as the union's keeping faith is concerned.

How about Government surpluses of construction equipment? The United States Government has billions of dollars in construction equipment scattered all over the world; what will be its policy of disposal? The civilian administrator of surplus property disposal has no authority until the Army or Navy declares these goods surplus property. The goods are scattered far and wide and are rapidly deteriorating. The Army and Navy are demobilizing so rapidly that probably there is neither labor nor shipping to return much of this equipment to this country. In any event this equipment would have to be largely rebuilt and reconditioned.

Future Costs?

How can one estimate the future costs of doing business? Here are some apparently elemental facts:

(1) Wages will be higher and for a time at least labor will not be very efficient or contented; therefore labor costs for nearly every employer will rise.

(2) The increase in labor costs in any one plant or industry will of course depend on the proportion of the whole cost, the labor cost represents. In the rock products industries direct labor costs seldom represent

more than 50% of the whole cost.

(3) While there may be a shortage of labor for a time, and high-priced labor for a long time, the price of money—capital—is the lowest ever. Tremendous surpluses of money and credit are going begging in the banks the country over. Interest rates are the lowest in history. Every effort possible will be made to prevent this money and credit from being used for stock-market gambling as it was used in the 1920's. Every effort will be made to have it used for capital investment in industrial development. Therefore, despite the greatly increased cost of new, modern machinery and equipment, it will be real economy for producers to invest large sums in them. With money or credit at 3 or 4 percent, where 6 percent or more used to be required, the increased use of even high priced labor-saving machinery and equipment is justified.

(4) To get the most out of plant investment it must be used as many of the 24 hours of the day as possible. In the ordinary rock products operation idle machinery is just as cost-absorbing as idle men. The portland cement industry is an excellent example of an economic manufacturing unit because it uses most of its plant investment 24 hours a day—an often overlooked reason why it is possible to produce and sell a much processed product so cheaply.

(5) High labor costs drive all producers and manufacturers to use ever more and more ingenuity in designing and building machines to eliminate common labor entirely. Once, no one thought of ever getting away from the telephone "hello" girls. Most city telephone exchanges are now automatic. The C.I.O. automobile workers will wake up some day to find an automatically operated assembly line.

(6) Those C.I.O. and other labor leaders who never are willing to admit that their members are well off, may eventually find a few of their members watching automatic assembly lines, at high wages perhaps, but far more of them will be living on government doles, that will come out of the pay envelopes of those still working, so that it will be difficult to see where anyone has benefited himself very much. In the long run, the laws of Nature never reward greed. By then or before, employers will have to contend with popular pressure to cease industrial, scientific and engineering progress for fear the Almighty will no longer have enough work to keep His children out of more mischief. But, says my friend, and I agree, we'll get by somehow. We always have.

Nathan C. Rockwood

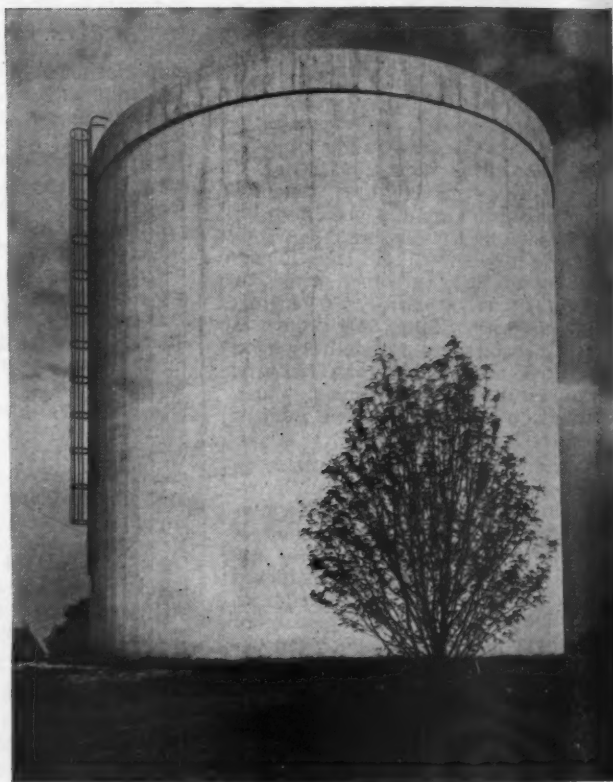
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Makes Concrete More Durable and More Plastic

SUNDAY EVENINGS—American Broadcasting Company (Blue) Network—U. S. Steel's "Theatre Guild on the Air"

the *Personal Side* of the NEWS

Calaveras Appointments

WILLIAM P. SCHWINDT, formerly traffic manager of the Calaveras Cement Co., San Francisco, Calif., has been named assistant vice-president and sales manager. M. J. LONDON will succeed Mr. Schwindt as traffic manager. A. A. HOFFMAN has been appointed consulting engineer, replacing LEWIS A. PARSONS who has been made consulting technologist.

Kelley Island Changes

N. D. SHAFTER has been appointed superintendent of the Marblehead, Ohio, plant of the Kelley Island Lime & Transport Co., Cleveland, Ohio. He will be assisted by C. E. WALMSLEY who has been named assistant superintendent. GEORGE CLEZIE has been transferred to the Genoa plant as superintendent of the Genoa white rock department, and L. E. SMITH has moved from the Genoa plant to Port Clinton, Ohio to assume duties in connection with maintenance at these plants.

P.C.A. Engineers

WALTER WOEBEL WOLF and CLYDE LOUTON STEWART, JR., have become members of the housing and cement products bureau of the Portland Cement Association, Chicago, Ill. Mr. Wolf, a graduate engineer of the University of Illinois with a degree of B.S.C.E., was recently junior highway engineer of the Illinois State Highway Department, working on concrete pavements, drainage structures, etc. Prior to that he was inspector for Consoer Townsend and Associates, architect engineers, in-



Walter Woebel Wolf

specting reinforced concrete ammunition storage igloos, reinforced concrete railroad docks, and concrete masonry loading line buildings. Mr. Wolf enlisted in the U. S. Navy in 1942 as assistant civil engineer with rank of Lieutenant in command of a



Clyde L. Stewart, Jr.

Naval Construction Battalion Company, serving at Dutch Harbor, Pearl Harbor, Saipan, and Okinawa over a period of three and one-half years.

Mr. Stewart is a graduate civil engineer, B.S.C.E., from Purdue University and before joining the P.C.A. worked for the Indiana State Highway Department, Joint Highway Research Project, conducting freezing and thawing tests of concrete cylinders from Indiana state highways and test cylinders of experimental mixes. Prior to that he was junior engineer, U. S. Army Engineers, Flood Control, Louisville District, and conducted compression and curing tests on ready mix concrete cylinders from levee walls and pumping stations. Mr. Stewart enlisted as a Naval Air Cadet in June, 1942, and was commissioned Lieutenant in the Marine Corps in May, 1943. He flew dive-bombers from bases in Samoa, New Hebrides, Guadalcanal, New Caledonia, New Georgia, Bougainville, Bismarks, Admiralties and Philippines. He was commanding officer of a Hildiver Squadron, Cherry Point, N. C., just prior to joining the Portland Cement Association with headquarters in Chicago.

F.H.A. Appointments

FRANKLIN D. RICHARDS, zone commissioner of Zone IV of the Federal Housing Administration, Washington, D. C., has been appointed to the newly created position of assistant commissioner, field operations. WALTER L. GREENE, previously serving as executive assistant to the commissioner was named to succeed Mr. Richards as zone commissioner of Zone IV, composed of the Mountain and Pacific Coast States. A. VAN PATTEN, formerly zone commissioner of Zone III has been transferred to Zone II, composed of the Southern and Southwestern States. He succeeds Kent R. Mulliken who has resigned to enter private business. GEORGE A. BREMER, previously serving as assistant zone commissioner, was named zone commissioner, Zone III, composed of the North Central States. John G. Rouse remains as zone commissioner of Zone I, composed of the Northeastern and Middle Atlantic States.

Represents Medusa

GEORGE DONALD, who has been engaged in the building materials business for many years, has been named Middle Western representative for Medusa Portland Cement Co., Cleveland, Ohio, with headquarters in Minneapolis, Minn.

Discusses Labor

FRANK A. HARDY, now with the Glacier Gravel Co., Seattle, Wash., and formerly with the Henry J. Kaiser Co., Portland, Ore., in charge of public relations and personnel discussed "Problems of Labor Procurement" before a recent meeting of the Seattle Construction Council.

Named President

FREDERICK VIEWEG, vice-president of the American Potash and Chemical Corp., Los Angeles, Calif., has been named president of the company to succeed F. C. Baker who has resigned because of ill health.

C. of C. Officer

DALE M. STRONG, manager of the Idaho Concrete Products Co., Pocatello, Idaho, has been elected first vice-president of the Pocatello Chamber of Commerce.

General Manager

EDMUND A. SMITH of Richmond, Va., has been appointed general manager of the Cinder Products Co., Kansas City, Mo.

Returns from Service

LIEUTENANT COMMANDER ANTHONY ANABLE, U. S. Naval Reserve, who has been on military leave since shortly after Pearl Harbor, has rejoined The



Lt. Comdr. Anthony Anable

Dorr Co., New York, N. Y., as director of public relations and advertising. As navigating officer of an aircraft carrier, Commander Anable participated in four major naval actions in support of the invasions of southern France, the Philippines, Iwo Jima and Okinawa. A veteran of World War I, he served in the navy's Cruiser and Transport Force which, in 1917-18, transported the first American Expeditionary Force to France.

Division Manager

WALTER R. MACATEE, formerly associated with the Edison Portland Cement Co. and the asphalt division of the Texas Co., has been named manager of the airport division of the American Road Builders Association, Washington, D. C. He has had considerable experience in airport construction, serving as Washington representative for the Asphalt Institute.

A.S.C.E. President

W. W. HORNER, consulting engineer, St. Louis, Mo., has been elected president of the American Society of Civil Engineers for 1946. ARTHUR W. HARRINGTON, district engineer, U. S. Geological Survey, Albany, N. Y., and J. T. L. McNEW, vice-president for engineering of the Agricultural and Mechanical College of Texas, both past directors of the Society, have been elected vice-presidents. Six new directors have been named: Shortridge Hardesty, New York City consulting engineer; Irving V. A. Huie,

commissioner, New York City Board of Water Supply; Albert Haertlein, professor of civil engineering, Harvard University; William R. Glidden, bridge engineer, Virginia State Highway Department, Richmond, Va.; William McKinney Piatt, Durham, N. C., consulting engineer, and Frederick W. Panhorst, bridge engineer, State Division of Highways, Sacramento, Calif.

Materials Chief

VICE-ADMIRAL BENJAMIN MOREELL, past president, American Concrete Institute, has been made Chief of the Materials Division in the Office of the Assistant Secretary of the Navy, succeeding Admiral S. M. Robinson who has retired. VICE-ADMIRAL J. J. MANNING, Director of the Eastern Pacific Division of the Bureau of Yards and Docks, San Francisco, Calif., will assume the duties of Vice-Admiral Moreell as Chief of the Navy Bureau of Yards and Docks in Washington, D. C.

Lone Star Official

J. BRYAN OLDHAM, general sales manager, Lone Star Cement Corp., New York, N. Y., has been named vice-president and manager of the Texas division, succeeding L. R. Ferguson, vice-president, Dallas, Texas, who will remain in an advisory capacity.

Phosphate Salesman

GEORGE W. MOYERS, recently discharged from the Navy, has resumed his duties as sales manager of the phosphate division of International Minerals and Chemical Corp., Chicago, Ill.

In Gravel Business

NORMAN ANDERSON, general contractor, Shelton, Wash., has announced that he has gone into the sand and gravel business, and will furnish ready mixed concrete.

Start Quarry

W. D. NOEL of Marceline, Mo., and J. W. Harvey and Lewis R. Taylor of Paris, Mo., are opening a quarry on the Tylor place, southwest of Paris. Agricultural limestone will be the principal item produced.

Named Sales Manager

HARRY B. ROBERTS has been appointed sales manager of the Union Portland Cement Co., Salt Lake City, Utah, replacing F. M. Maher who has retired because of ill health.

Chief Chemist Returns

CAPT. C. A. CLEM has returned from service in the chemical warfare branch of the Army to resume his former duties as chief chemist for

the Signal Mountain Portland Cement Co., Chattanooga, Tenn.

Association Engineer

H. HERSHEY MILLER has been re-appointed a special engineer representative of The Pennsylvania Sand and Gravel Producers' Association, Pittsburgh, Penn. Mr. Miller was formerly with the Pennsylvania State Highway Department, The Pennsylvania Turnpike Commission, and The Calcium Chloride Association.

New Company Formed

NORMAN VINCENT, president of Mica Co. of Canada, reports the formation of a subsidiary, Canadian Anode Products. The new company operates under patents held by Aluminum Co. of Canada for the anodizing of aluminum products in a wide range of colors. The new plant is under the management of Grant Clouse.

Join Universal

R. N. VICKERY has been appointed technical engineer of the Universal Atlas Cement Co. in Iowa and Nebraska, and J. A. Hunter has been made sales representative in southwestern Iowa.

OBITUARIES

J. E. JUBAN, president of the Ross Gravel Co., and of the Juban Sand and Gravel Co., Shreveport, La., died recently. He was 55 years old. Mr. Juban was born at Denham Springs, La., in 1890 and moved to Shreveport in 1913, where he entered business and resided throughout the remainder of his life.

CHARLES F. CONN, retired president of the Giant Portland Cement Co., Philadelphia, Penn., passed away recently after a brief illness. He was 80 years of age. Mr. Conn was president of the company for 37 years and retired two years ago. He was chairman of the board of directors at the time of his death.

MISS KATHERINE BRISCH, who with her brothers Thomas, who died some years ago, and Michael, Sr., founded the Brisch Brick Co. and the Rockwell Lime Co., both of Chicago, Ill., passed away recently. She was 75 years of age.

CHARLES P. REIDY, retired chief electrical and steam engineer of the Universal Atlas Cement Co., Allentown, Penn., died recently at the age of 66. Mr. Reidy had retired in 1943 after 39 years of service.

SIR ARCHIBALD MITCHELSON, who was active in founding the Alpha Cement Co., died recently at Coombe Hill, Surrey, England. He was 67 years old.

Ohio Agstone Conference

WITH a very informative program and speakers of note, the Ohio Lime Conference drew many producers of agstone to its 1946 meeting in the Administration building of Ohio State University on January 4, 1946.

JAMES EELLS, Basic Refractories, Inc., Cleveland, Ohio, president of the Processed Limestone Association, presided at the morning session and introduced the first speaker, H. D. Lewis, chairman of the Department of Agronomy, Ohio State University, who spoke on "What Is Happening to the Soils of Ohio? What Can Be Done About It?" He stated that while Ohio ranks 35th in area among the states, its agricultural production is sixth. He emphasized that "The trend in the intrinsic productivity of the average soil in Ohio has thus far, but not inevitably been downward; the yield of crops has been sustained and even increased by the interjection of numerous new techniques and more efficient germplasm of the plants grown on the soils." He said that longtime objectives should be toward rebuilding and maintaining soil productivity rather than toward continued exploitation and loss of the basic soil resources.

Causes of Declining Productivity

Mr. Lewis listed seven processes that are responsible for declining soil productivity which are: Removal of nutrients in harvested crops, loss of nutrients in drainage waters, increasing acidity of most soils, destruction of organic matter through tillage, changes in physical properties of soil adversely affecting soil-air-water relationships, lower types of biological activities, and removal of soil by erosion. Mr. Lewis stated that the long-time objective of agronomists is a positive productivity balance and that while a slight progress was registered in the 1930's, this was nullified during the war years. Among the major practices for soil building and efficient production of crops, he said that an accelerated program of liming was highly important. He said that from 30 to 35 million tons of ground limestone would be required to raise all rotated and pasture lands to reactions suitable for good growth of alfalfa or clovers; that from 1.5 to 2 million tons additional will be required annually to replace removals through crops, drainage waters, and erosion; and that during 1943, 1,520,000 tons were used while 1,787,000 tons were used in 1945.

Results of Field Trip

EARL JONES, of the Department of Agronomy Extension of Ohio State University, was the next speaker. His talk, entitled "Effective Service by

Local Dealers in Liming Materials", dealt with the results that were obtained from a field trip in which 17 dealers of fertilizer, grain and feed, and liming materials were contacted. Of the 17, five operated on AAA contracts, and in answer to the question: "Do farmers buy more lime than that allotted by AAA?" he found that two of the five answered 10 percent, two answered 25 percent and one answered that 40 percent of the farmers do purchase additional lime. To the question "Do farmers accept delivery at any time?" the answers varied from 10 to 100 percent. Other questions asked were: "Are you canvassing the farmers to promote the sale of liming materials?" and "Are you trying to promote deliveries in July and August?" While the answers were not indicative of the trend for the whole state, Mr. Jones' idea in contacting the dealers directly met with approval of those attending the meeting. All felt that it was a step in the right direction towards finding out the difficulties in selling lime.

Liming Program in Other States

HENRY A. HUSCHKE, managing director, Agricultural Limestone Division, National Crushed Stone Association, Washington, D. C., was the next speaker. His talk was entitled "Liming Programs in Other States". He illustrated his remarks with a chart that showed the trends of liming material consumption from 1929 through 1944; the amount of limestone furnished by the AAA; and the cash farm income for the same period. This chart showed that agstone consumption dropped from 1929 to 1933 then rose to 1944, when there was an all time high. He stated that the figure will probably drop in 1945. Mr. Huschke showed that an almost exact parallel existed between the liming consumption and the amount furnished by AAA, and that there was also a correlation between consumption and cash farm income. He then showed how liming practices had increased in various sections of the country and mentioned the importance of research work. He spoke of the loans that the Federal Reserve Bank will make to farmers so that they can purchase lime and fertilizer for their lands. He said that 51 million tons of agricultural limestone should be used in this country per year.

New Ohio AAA Plan

The next speaker, Dale Williams, of the Ohio Agricultural Adjustment Administration, Columbus, Ohio, told of the new AAA plan for distributing limestone in Ohio effective in 1946. The Ohio Agricultural Conservation Committee has decided to furnish

assistance to farmers who wish to purchase limestone for 1946. Agricultural Conservation Program practices through a purchase order plan instead of contracting as has been done in the past. Purchase order forms will be issued by the county Agricultural Conservation Committee to farmers who desire such assistance. When a purchase order is issued, the State committee will pay the dealer on whom such an order is issued an amount equal to the credit rate approved for the township in which such limestone will be used or the fair price, whichever is lower. The dealer will collect from the farmer the difference between the credit rate and the fair price which is determined by the county committee when they approve the purchase order. Purchase orders will be issued for limestone meal, ground limestone, substandard ground limestone, and slag products. No contracts will be entered into between the county committee and the dealers under this plan, but the farmer may select the dealer from whom he wishes to purchase liming material.

Purchase orders are good until the expiration date and in no case for longer than a 60-day period. When limestone is not purchased before the expiration date, the purchase order becomes invalid and a new one must be made out. The farmer can, if he wishes, purchase limestone without a purchase order. In such cases, he will be repaid at the township credit rate for the number of tons approved by the county committee.

A discussion followed Mr. Williams' talk in which he answered many of the questions that arose regarding the new program. The meeting adjourned and luncheon combined with the afternoon session was held at a dining room away from the campus.

Sales Promotion for Agstone

The afternoon session was called to order by P. E. Helm, Carbon Limestone Co., Youngstown, Ohio, who introduced Kenneth Dameron, Professor of Advertising, Ohio State University. Mr. Dameron conducted a round table discussion on advertising and sales promotion for the limestone industry. He stated that producers must learn to sell all over again after the relatively easy time that they had during the war, when everyone wanted to buy. There is a definite need for sales promotion on the part of producers in this field, since agstone has long been a by-product of crushed stone. Mr. Dameron gave the producers food for thought with a few pertinent ideas intended to help them to investigate their sales promotional activities, regarding regularity and frequency of limestone purchases, benefit of sales promotion, factors in sales resistance, dealer-producer relations, types of

(Continued on page 118)



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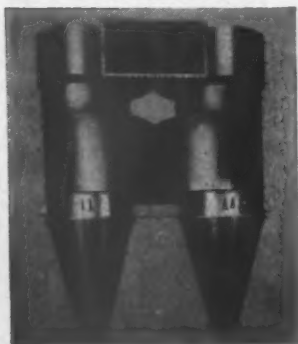


Illustration shows typical unit of a battery of six Buell Fly Ash Collectors installed with stoker fired boiler in power plant of University of Illinois.

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★ ★ ★ *Washington* NEWS

STRIKES spotlight the national news with workers in steel, automobile, and meat industries on the picket lines. The situation is probably more acute than it ever has been in the history of the country. Cessation of work in the steel industry affects practically every other industry in the United States, and a prolonged strike will seriously interfere with reconversion and a resumption of production to meet peace-time demands. Of direct interest to the rock products industry is the restoration of rigid controls in the distribution of steel by C.P.A. All steel will be rationed with emergency requirements being met by AAA priority, CC and MM ratings being suspended for the duration of the strike.

Manufacturers are reluctant to make commitments on sales for future delivery as they cannot anticipate what their costs will be. It is not simply just a question of figuring an increase in the price of steel but a pyramiding of costs all along the line for castings, bearings, motors, and many other materials, all of which will cost more, and the increases will have to be reflected in the delivered price of the assembled machine.

Housing Program

Applications for nearly 500,000 units of public housing requested as a three-year program have been filed with the Federal Public Housing Authority. The applications consist of 355,599 units requested by 334 urban localities and 141,473 units for 282 rural counties, according to testimony before the Senate Banking and Currency Committee.

The Wagner-Ellender-Taft Housing Bill, S. 1592, on which hearings are being held, would increase authorizations for annual federal contributions to communities by \$22,000,000 a year in each of the first four years after its passage. This will permit about 125,000 units a year or a total of 500,000 for the four years. It also would authorize contributions sufficient to provide about 38,000 units or a total of 190,000 rural houses in this five-year period.

Concrete Products Machinery

Under Priorities Regulation 28, Direction 8, the C.P.A. on January 9 assigned a CC rating to requests of concrete products producers for machinery to meet urgent demands from the construction industry. With CC ratings for steel cancelled as a result of the steel strike, it may be difficult

for manufacturers of concrete products machinery to deliver under these ratings, but the preference stands as soon as strike conditions are alleviated. Details of the C.P.A. regulation follow:

(b) *Manufacturers of "special" concrete products machinery.*—(1) *Production materials.* CC ratings may be assigned to manufacturers of "special" concrete products machinery for production materials (including those to be sold as maintenance, repair and operating supplies for such machinery) where the manufacturer of the concrete products machinery demonstrates that he is unable to obtain delivery of the minimum amount at the latest date practicable without a rating.

(2) *Capital equipment and MRO.* CC ratings for capital equipment and MRO for the machinery manufacturer will be assigned only as provided in PR-28.

(3) *Meaning of "special" concrete products machinery.* "Special concrete products machinery," as used in this direction, means machinery and equipment of a general type designed solely for the production of concrete building products and useful only for that purpose (such as concrete block and brick machines and attachments, including concrete mixers and ship loaders as commonly used in the concrete products industry), but does not include general types of equipment suitable for other use even though a particular piece of equipment is designed and built expressly for the concrete products manufacturer (e.g., an electric motor built by a motor manufacturer specifically for a concrete block manufacturer).

(c) *Denials of CC ratings.* The CC rating will be denied where it appears that the item for which a CC rating will be used is available, but under different terms of sale or from a supplier other than the applicant's customary supplier.

(d) *PR-28 still applies.* In any case not covered by the above, CC ratings will be assigned only as provided in Priorities Regulation 28.

Gypsum Products

Manufacture of gypsum products has not kept pace with the demand, according to a recent Civilian Production Administration report.

In January, 1945, output amounted to 163,000,000 sq. ft. of gypsum board and lath. By September the figure had risen to 174,000,000 sq. ft., and the

estimate for October is 198,000,000. Indications are that total November production will be approximately the same as October's. These monthly production figures are well above the pre-war output of the industry. In an average month in 1939, for instance, production of gypsum wall board, sheathing and lath amounted only to 129,000,000 sq. ft.

Overtopping the recent production figures, however, are the estimates of unfilled orders, which jumped from 169,000,000 sq. ft. in January, 1945, to 631,000,000 sq. ft. for October. These figures by no means represent total demand, as the backlog of many plants is so extensive that they have stopped accepting orders.

It is estimated that a production of 2,600,000,000 sq. ft. would satisfy the needs for \$6,500,000,000 worth of construction, including 400,000 dwelling units, in 1946. About 40 to 45 percent of the demand for the 2,600,000,000 sq. ft. of gypsum board, it is believed, will be for gypsum lath.

Production of gypsum lath, which is in particularly short supply nationally, declined from approximately 65 percent of the total production of gypsum board in 1938 to 25 percent of total production in the second quarter of 1945. This decline was due mainly to a wartime accentuated need for quick dry-wall construction and, consequently, for more wall board and less lath. Price also played a part in the drop in lath production. The proportion of lath production now is improving.

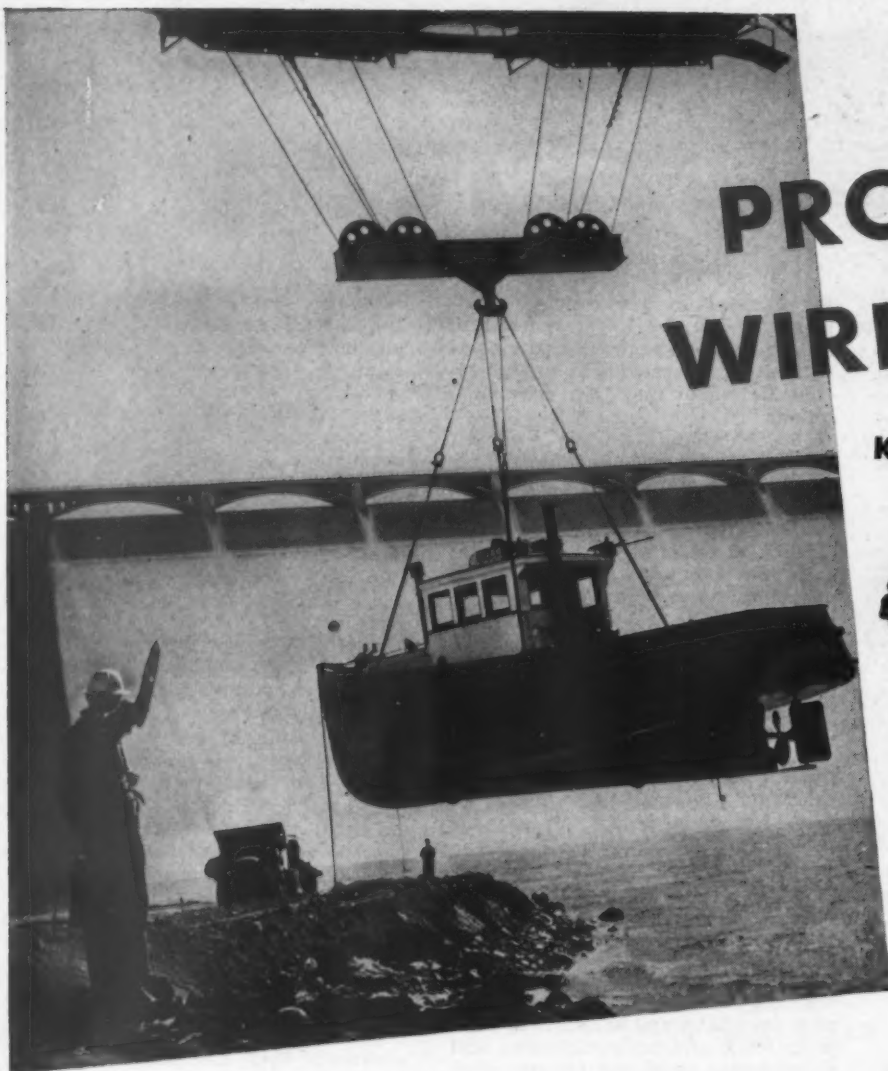
Ceiling price increases granted by the Office of Price Administration in August on gypsum lath produced in the Eastern Tidewater and Pacific Coast sections, and in November for inland producers, promise a further rise in the production of gypsum lath within the total production of all gypsum board products.

New Pricing Method

O.P.A. has established a new price method to enable producers of specified building materials to ship outside their normal marketing areas into temporary shortage areas.

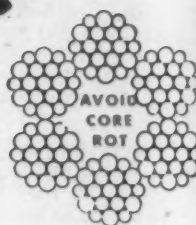
Effective December 15, 1945, producers who elect to use this new method may add the full amount of freight costs to the f.o.b. plant maximum prices of their product. Industrial users of the materials will be required to absorb the amount of the increase.

(Continued on page 72)



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TEXACO Lubricants and Fuels

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

Safety Awards

UNIVERSAL ATLAS CEMENT Co., Duluth, Minn. and Independence, Kans. plants, operated without a single lost-time accident in 1945. Both are eligible for the Portland Cement Association safety trophy. This is the tenth such award for the Duluth plant and the seventh for the Independence plant. Universal Atlas plants have earned 43 of these trophies to date. Gordon C. Huth, manager of industrial relations, is in general charge of safety work for the company.

Calif. Aggregates Plant

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., has leased 500 acres of land near Carbona, Calif. and is planning to start construction early this year on a new \$300,000 plant for production of sand, gravel and crushed rock at that location. Capacity of the operation, one of several major expansions planned by the company, will be about 400 t.p.h. aggregates.

Forecast Cement Production

INDUSTRY leaders have estimated that the portland cement industry will ship 140,000,000 bbl. of cement in 1946, a 30 percent increase over 1945 shipments. It is anticipated that when plant capacity is restored and increased, yearly shipments between 1947 and 1957 will run around 165,000,000 bbl. Bureau of Mines reports

show that the output for October, 1945, was 21 percent greater than that for October, 1944; shipments were up 30 percent.

Production throughout the nation varied from a 19 percent decline in October, 1945, over October, 1944, totals, to a 70 percent increase in Ohio for the same months. Cement production has been held back due to lack of skilled operatives, and it is said that veterans thus far are not returning to their former jobs in cement plants on any appreciable scale. In 1942, the peak year for cement output, about 23,492 workers were employed in the industry. Bureau of Labor statistics show that in September, 1945, 19,400 workers were employed, an increase of almost 1000 over the previous month. However, in Eastern regions, it is reported that the shortage is especially bad.

Erect Storage Plant

MARQUETTE CEMENT MANUFACTURING Co., Chicago, Ill., has purchased about 3½-acres of land on the north branch of the Chicago river from Material Service Corp. The company plans to erect a \$200,000 storage plant at the new location and cement will be shipped by barge from the Oglesby, Ill. mill.

New Sand Concern

MIDWAY SAND & GRAVEL Co., Kent, Wash., has recently started operation under the ownership of J. Louis and N. Romano.

Ideal Establishes Fellowships

IDEAL CEMENT Co., Denver, Colo., has established two fellowships, to be known as the Charles Boettcher fellowships, at the Engineering Experiment Station of the University of Colorado. The fellowships will be used for applied research on concrete.

Idaho Block Plant

EMPIRE CONCRETE PRODUCTS, Moscow, Idaho, a new concern, is starting production of concrete block in a new \$25,000 plant. The new plant, which has a capacity of 4000 block a day, is owned by Fred H. Simkin and Leo F. McCarty. Mr. Simkin is completing four years in the army air corps and Mr. McCarty formerly was a concrete inspector for the Seattle Light & Power Co. Ready-mixed concrete probably will be added later.

Open Quarry

LORING QUARRIES CORP., Lincoln, Kans., has opened a new quarry at Loring, near Bonner Springs, Kans., for production of crushed stone for construction purposes. Plans include the erection of a concrete products plant in the near future, for the manufacture of concrete masonry units, concrete pipe and concrete brick.

Opens Cast Stone Plant

MILTON ALINGH, recently released from the armed services, will open a cast stone plant in Sioux City, Iowa. Prior to entering the armed services, Mr. Alingh was superintendent of the cast stone department of the Concrete Brick and Stone Co., Sioux City.

"Surplus" Cement

SHARONVILLE Army Engineer depot, outside Cincinnati, Ohio, has announced the release of 20,000 bags of cement as surplus and saleable property. The 940 tons of cement will be available to civilian industry through the Reconstruction Finance Corp.

Install Third Collector

WARNER Co., Philadelphia, Penn., is installing a third dust collector at the Bellefonte, Penn., lime plant.

Iowa Block Concern

VICTOR RAIDER, Eldora, Iowa, has purchased an automatic tamper and has gone into the concrete block business.



Houses and plots of ground for employees of Sweden's most modern cement plant

Our Cover Page

THE MODERN, fire-safe rock and sand plant of Blue Diamond Corp., Ltd., Los Angeles, at Arcadia, Calif., is featured on the cover page. This



Blue Diamond plant at Arcadia, Calif.

plant, erected before the war, has proven out well and its design deserves consideration in some of its details. The all-steel construction, the self-cleaning bins and the liberal clearance between the tops of the bins and the screening equipment overhead (some 20 ft.) are of particular interest. Having adequate roominess and headroom is contributory to the flexibility and efficiency required in arranging to produce a multiplicity of sizes and for changes in production necessitating changes in bin chutes, etc.

Washington News

(Continued from page 69)

The first material to which this action will apply is crude gypsum when sold for use as a retarder in the manufacture of cement. As conditions arise creating temporary shortage areas for other building materials, they will be placed on the list of commodities that may qualify under the new pricing method.

Previously, the maximum price of a producer, who quoted a price at a particular destination on a freight allowed or freight equalized basis, was frozen at the highest price that he charged a buyer of the same class at the same destination in March, 1942, regardless of the location of the seller's plant. Thus, O.P.A. explained, producers of building materials with many plants at various locations across the country have been unwilling to make shipments outside their normal marketing areas into areas where shortages of the materials had developed, because they would have had to assume the additional freight costs.

To be permitted the use of this pricing method, the producer of a building material first must file application with the Building Materials Branch of O.P.A.'s national office. Unless he hears from the application within 15 days after filing, he will consider his new maximum prices approved.

Appraise Piqua Estate

THE SUM probably collectible on securities from the estate of the late Mrs. Mary Foulds Hall of Piqua,

Ohio, is given at \$101,800 from 2036 shares of the Ohio Marble Co. and 100 shares of Piqua Quarries, Inc., of Piqua, Ohio.

New Asbestos Applications

RODDIS LUMBER AND VENEER Co., Marshfield, Wis., is manufacturing a fire retardent door using asbestos cloth as a basic constituent. The core of the door consists of pine strips of varying lengths assembled with the grain running from top to bottom and with hardwood edge strips provided at the top, bottom and two sides. Woven asbestos cloth, 1/16-in. and 1/20-in. hardwood cross-bandings are glued to both sides of the core. Doors are made in several grades, one to withstand a 45-minute fire test and one a 60-minute test; and one to be flameproof for 30 minutes.

ATLAS ASBESTOS Co., North Wales, Penn., manufactures an asbestos wick for cigarette lighters. The wick, made with a core of glass yarn braided with asbestos yarn, is said to have a remarkably fast capillary action and long life.

Reopen Kansas Quarry

LORING QUARRIES, Bonner Springs, Kans., idle for almost a year, will resume production this year with greatly increased operations. Emmett Patrick Conolan is the new superintendent of the plant.

Colorado Mine Survey

STATE MINERAL RESOURCES BOARD of Colorado is surveying mine possibilities in the State for the benefit of companies interested in producing industrial and metallic minerals.

Expands Business

BREWER SAND AND GRAVEL Co., Holland, Mich., has consolidated business interests with a coal concern, recently purchased, according to Cornelius Brewer, owner.

New Office Building

AZUSA ROCK AND SAND Co., Azusa, Calif., has a new \$40,000 rock and sand plant under construction and is planning construction of an \$11,000 office building at the plantsite.

Open Limestone Quarry

WILLIAM A. SOUTH, Peoria, Ill., will open a limestone quarry and operations are scheduled to start in May, 1946.

Move Penn-Dixie Office

PENNSYLVANIA-DIXIE CEMENT CORP. has moved its sales office in the Baker bldg. in Minneapolis, Minn., to larger quarters in the same building.

COMING CONVENTIONS

American Concrete Institute, Annual Convention, Hotel New Yorker, New York, N. Y., February 19-21, 1946.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, Chicago, Ill., February 25-28, 1946.

American Society for Testing Materials, Spring Meeting, Pittsburgh, Penn., February 25 to March 1, 1946.

American Society for Testing Materials, Annual Meeting, Buffalo, N. Y., June 24-28, 1946.

Cast Stone Institute, Annual Meeting, Bismarck Hotel, Chicago, Ill., March 11 and 12, 1946. Board of directors meeting March 10.

National Association of Home Builders of the United States, Annual Convention and Exposition, Stevens Hotel, Chicago, Ill., February 25-28, 1946.

National Concrete Masonry Association, Annual Meeting, Hotel Sherman, Chicago, Ill., March 12-14, 1946.

National Crushed Stone Association Annual Meeting, Netherland Plaza, Cincinnati, Ohio, Week of January 28, 1946.

National Industrial Sand Association, Annual Meeting, The Homestead, Hot Springs, Va., May 15-16, 1946.

Chemist Corner

Determining Air Content of Cement Mortars

By C. J. KNICKERBOCKER

FOR determining the air content of portland cement mortars, the American Society for Testing Materials method (C185-44T), requires the use of the equation:

$$\% \text{ air by volume} = 100 - \frac{2W}{(182.7 + P)}$$

$$(5000 + 10P)$$

An approximate solution of this equation may be made by substituting the determined values in the chart shown. The solution time is materially shortened and the determined values are sufficiently accurate for most purposes.

Air content values that border on specification limits are best calculated arithmetically although the chart values are less in error than are those obtained by varying the mixing technique. Whereas the chart values

are correct within a few tenths of one percent air content, the values may be altered three or four percent by varying the mixing rate.

The specified mortar air content method is of considerable value when used for routine control of the mortar air content of masonry cements, although the maximum air entrainment cannot always be realized due to the limiting of water content necessary for the prescribed mortar consistency (flow).

To use the chart solution for cements that have a lower specific gravity than that of portland cement (3.15) the following rule may be applied;

For each 0.10 reduction in the gravity of the cement used, deduct 0.4% from the chart value for mortar air content.

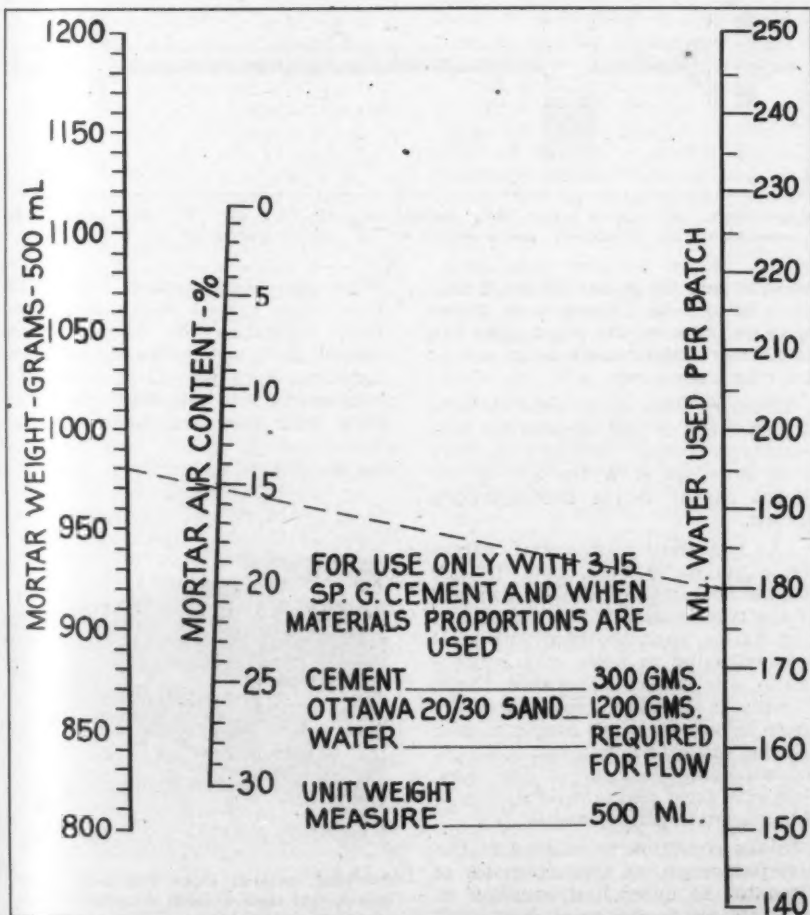


Chart for determining air content of portland cement mortars

ATTENTION CHEMISTS!

Your participation in making **ROCK PRODUCTS' "Chemists Corner"** better than ever as a medium for interchange of ideas and thinking is invited. Articles on your ideas and results of research and your comments on matters relating to your profession in the industry will be published.

ROCK PRODUCTS will pay for acceptable contributed articles at the highest space rates.

—The Editor

Examples of the use of the chart are here given:

Cement gravity 3.15
Water used 180 ml.
Mortar weight 980 gms.

Specified proportions

Substitution in specification equation gives 15.1% air

Chart solution as illustrated gives 15.2% air

Substituting a 2.85 gravity cement and assuming the above water and weight values;

Calculation gives 14.0% air
(Equation based on 2.85 Sp. G.)

Chart solution is: 15.2 — (0.4 x 3), or 14% air.

High Alkali Cements

A JUSTIFICATION of the U. S. Bureau of Reclamations specifications for portland cement, limiting the alkali ($\text{Na}_2\text{O} + \text{K}_2\text{O}$) to 0.60 percent, is contained in the January, 1945, *Proceedings of the American Society of Civil Engineers*. The paper is entitled "Deterioration of Concrete Dams Due to Alkali-Aggregate Reaction," by R. F. Blanks, and H. S. Meissner.

According to these authors the surface cracking of massive concrete structures is only a symptom of the trouble. These cracks are usually less than 2 ft. deep, and aside from the fact that in severe climates they aid the natural disintegration, they are not the serious factor in alkali cement + active silica aggregate reaction. The serious factor is the loss of modulus of elasticity in the concrete mass, as measured on drill cores. For example, cores taken from Parker dam in California three years after construction had an average modulus of elasticity of 2,200,000, while 1-year-old control cylinders made during construction had an elastic modulus of 4,200,000. Other dam concrete is mentioned where the elastic modulus fell to about half in a few years.

As the elastic modulus is generally

(Continued on page 124)

HINTS *and* HELPS

Practical Ideas Developed by Operating Men

Light Weight Analyzer

DOW CHEMICAL Co., Midland, Mich., is using a gas analyzer constructed of extruded magnesium tubing and plate and finished with aluminum



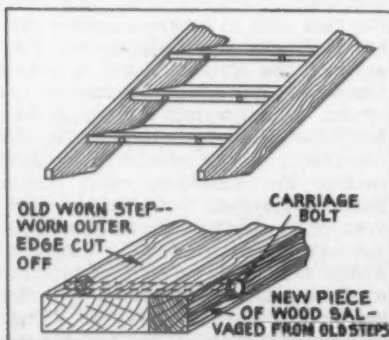
Gas analyzer constructed of magnesium for lighter weight

paint. The magnesium has made this analyzer 11 lbs. lighter than the steel apparatus it replaced which weighed 20 lbs. It is used to determine the amount of carbon dioxide, carbon monoxide and oxygen and must be carried frequently to different locations in the building for the purpose of taking gas samples. Besides being easier to handle, the magnesium unit is strong and sturdy and has a neat appearance.

Repair Wooden Steps

By J. F. PRUYN

Shown in the accompanying sketch is a method of repairing wooden steps



Old wooden steps repaired with new strips of wood at the edge bolted to steps with carriage bolts

with carriage bolts which has proven to be of considerable help to several operations in the West. With wood harder to get than carriage bolts, this method of removing the worn outer edge of a wooden step and attaching a new piece to it by bolting has permitted salvage of steps that otherwise would have to be replaced entirely.

Simple Alternate Drive

By A. B. EDSON

Occasionally, it becomes necessary to provide alternate means to power a plant, for example, to have a standby engine for a drive normally handled by an electric motor, in the event that the supply of current should fail at a critical time.

Sometimes it has been found to be an economy to use one source of power, such as an electric motor to drive either of two plants which are not required to operate at the same

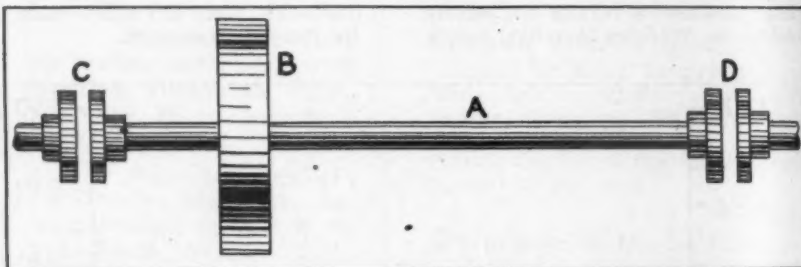
the appropriate coupling, power is available at "B."

In the arrangement described in the second paragraph, if power is applied to pulley "B" from a suitable source, and the drive to one plant is taken from an extension of the countershaft "A" attached to the outer half coupling at "C," and the second similarly from "D," new power can be supplied to either plant by the insertion of the fabric disc in the appropriate coupling.

A modification of the first arrangement has been in use for many years, with complete success, in a case where provision had to be made to change a crusher drive in certain contingencies from d.-c. to a.-c. motor.

Traveling Crane for Pipe

FEHR CONCRETE PIPE WORKS, Eau Claire, Wis., has constructed a monorail overhead travelling crane system to handle large precast con-



Countershaft "A" carries pulley "B". Flexible couplings "C" and "D" allow power to be applied to "B". Alternately, power applied at "B" can be transmitted to "C" or "D"

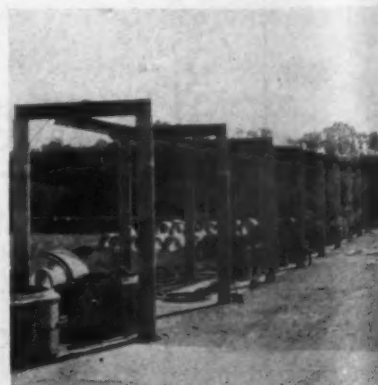
time. Where the power supply is limited, it may be necessary to insure that no more of the plant than can be driven satisfactorily is in use at any one time.

Either of these cases (and variants of them) can be met successfully with maximum power efficiency in very little floor space by the use of the layout shown in the accompanying sketch.

"A" is a short countershaft carrying a pulley "B." "C" and "D" are flexible couplings of similar size and of the type consisting of steel or cast iron halves, each provided with steel pegs engaging in holes in a rubber-fabric disc inserted between them. The disc is slightly narrower than the space between the half couplings, and can be withdrawn without difficulty following the removal of the pegs. Only one drive disc is needed to provide alternate arrangements.

In the condition mentioned in the first paragraph, an electric motor is fitted to the outer half coupling at "C," and an engine to that at "D." When the driving disc is inserted in

crete pipe. The system consists of nine bents, spaced 20-ft. apart, each bent consisting of two supports spaced 12-ft. wide. The supports are constructed of five 12-in pipe, 3-ft. long, set on end and filled with concrete with four sets of reinforcing



Overhead monorail crane and hoist system with upright supports made of sections of concrete pipe which have been filled with concrete and vertically placed reinforcing rods

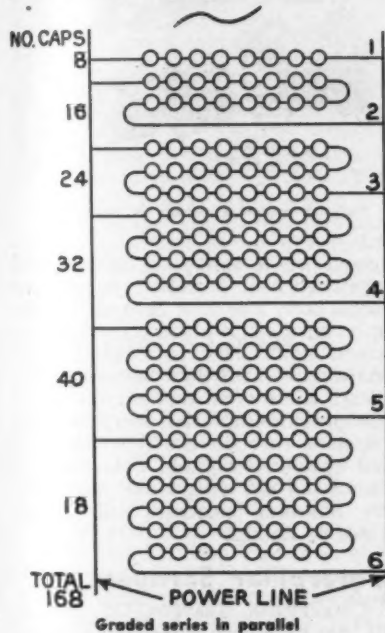
HINTS AND HELPS

bars through the length of the support. The reinforcing bars, 6-ft. in length, overlap to form a secure union between the pipes. Each support rests on a concrete footing, 2-x 4-x 4-ft. and placed 2-ft. underground. On top of each bent is a I-beam to which is secured the long I-beam on which the travelling crane moves. The system can accommodate ten tons.

Increasing Capacity of Blasting Machine

By PAUL C. ZIEMKE

CONVENTIONAL rack bar type of blasting generator (erroneously termed a "battery" by some persons) may be used to better advantage if



the blast network is divided into a series of parallel circuits comprising a number of series which increase in number progressively in even increments. This circuit is particularly valuable in areas which may require an abnormal number of shots.

The hook-up is designated as the graded series-in-parallel circuit wherein the caps fire progressively from the lowest to the highest numbered series with a rate of detonation that appears instantaneous to the human senses. It is recommended that a difference of eight caps be maintained as the minimum difference between series. A cap or two, more or less, in any series will not affect the success of the shot, nor will a slight difference in sensitivity.

By way of simplifying the circuit, a diffuse of ten caps should be maintained. An irregular series-in-parallel group such as 4-8-12-16-20-24-28 (a difference of four) will not always fire successfully as tests have proven.

Next in order for consideration is

EXPLOSIVE CHARGES

Quantity of explosive per foot of drill hole for various types

Diameter of drill hole (inches)	Gelatin dynamite (pounds)	"Straight" dynamite (pounds)	Low freezing ammonia dynamite (pounds)	Extra dynamite (pounds)
3	4.25	3.75	3.60	3.72
3½	5.68	5.10	4.89	5.07
4	9.35	8.40	8.06	8.38
5	11.80	10.50	11.08	10.35
5½	14.94	13.20	12.53	13.00
6	17.00	15.00	14.40	14.90

the problem of resistance, which will vary according to the length of the cap, by wires and the connecting jumper or end leads. The total of the resistance in each series is actually the determining factor for 100 percent detonation of the shot. Connecting wire of No. 20 gauge will serve for the connecting jumpers and end leads, but nothing smaller than No. 14 wire should be used for the main conductors. The largest series should not exceed the maximum number of caps that the blasting machine is designed to fire.

The reason for the apparent increase in the capacity of the machine or power is easily explained. In a series-in-parallel circuit, the total current applied to the circuit is divided between the several series. The regulated distribution of the current assists in the successful detonation of the shot, because each series draws a percentage of the total current in relation to the resistance as compared to the remaining series.

This is not true, however, in the graded series-in-parallel circuit, since there is a broad variation of caps. The first series in the circuit will draw twice the current of the second series, three times as much as the third, and so on for the entire group consisting of 10, 20, 30, 40 and 50 caps. The time lapse required to fire a given series varies inversely with the current, thus the first series fires first and opens up before the second series, or any other series, has had time to heat up. The opening of the first series makes more current available for the second series, and this holds true up to the final series.

Although the time interval between explosions is too minute to be detected by human senses, there still is a definite time interval which is utilized to advantage in the successful firing of three times the number of shots ordinarily possible.

As with a straight series circuit, only one brand of caps should be used, since there may be a minute difference in resistance values between different manufacturer's brands.

When power from lines, or a portable lighting plant is available, 1000 shots may be fired successfully if close attention is paid to electrically-perfect splices, if caps are waterproofed for wet work, and if adequate wire sizes are used in the main feeders.

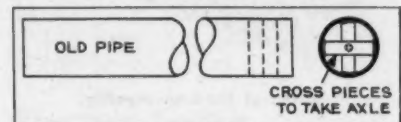
This table should be useful in stripping operations where rock formations are comparable with lime-

stone. Detonating fuse is recommended as the detonating agent because of the safety and simplicity with which it can be installed and the ease with which it lends itself to deck loading.

Make Wheels from Pipe

By J. F. PRUYN

WHEELS for welding machines, wheel barrows, etc., can be made from sections of old discarded pipe



Showing how wheels are made from sections of pipe

by cutting off a 2-in. section from the end of the pipe and welding strap spokes in place. The sketch shows the operation, which is employed in several Western plants.

Navy L.C.M. Dredge For Sand Recovery

KANSAS SAND Co., Topeka, Kan., has purchased a 40,000-lb. LCM—landing craft, mechanized, for use as a combination tug-boat, sand dredge and dry dock. The boat, built by the Kansas City Structural Steel Co., for use in the Pacific, is 66-ft. long, and is capable of carrying 60,000 lb. of cargo. One of its first uses will be as a dry dock to clean and repair pontoons now used in floating the company's dredge. Later it will be used as a dredge and to tow the company's larger dredge between locations on the Kaw river.

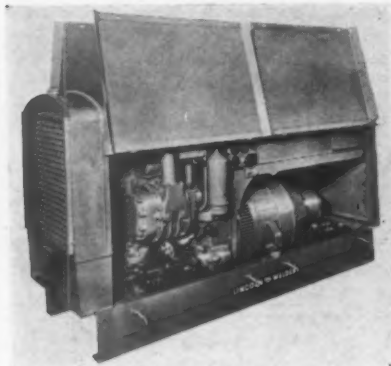
Water-Borne Cement

PERMANENTE CEMENT Co., Oakland, Calif., has received approval from the Seattle board of public works to permit use in Seattle of cement transported by water, provided the water-borne distance does not exceed 1000 miles. Amendment of the city building code and standard board specifications by the Board with ratification by the city council will permit Permanente to proceed with plans for construction of a distributing plant in Seattle. The company plans to ship cement or clinker aboard specially-constructed ships to Seattle for final processing when the projected plant is completed.

NEW MACHINERY

Diesel-Driven Welder

LINCOLN ELECTRIC Co., Cleveland, Ohio, has announced a new Diesel engine-driven welder of 300-amp.



Welder of 300-amp. capacity

capacity. Claims for the new unit, manufactured particularly for use in locations where electric power is not available or not economical, are that the engine can cut fuel costs up to 86 percent, and total savings may reach as high as 40c per hour. It is a compact unit, weighing 2,560 lb., and can be readily mounted on wheels or trailer for portability. The controls permit the operator to select any type of arc and any arc intensity to suit the job.

Mobile Machine Shop

DAVEY COMPRESSOR Co., Kent, Ohio, has developed a truck-mounted repair shop for use of contractors, mines, highway departments, and all concerns operating over extended



Truck-mounted repair shop equipped to handle practically any job

areas. Purpose of the unit is to eliminate the hauling of broken-down machines to central repair shops. The unit is suitable for mounting on any standard long wheel base truck, and while any combination of equipment can be supplied, the company has worked out a number of standard assemblies for the use of specific operators. All driven units, such as air compressors, welding generators

and power generators, take the power from the Davey Split Propeller Power Take-off which can be inserted in the drive shaft of the truck to transmit the power of the truck engine to these units. This take-off is also used on concrete mixers, pressure pumps and other equipment commonly mounted on trucks.

Sand Filter

THE HARDINGE Co., Inc., York, Penn., has brought out an automatic backwash rapid sand filter for clarification of boiler feed water and for treatment of thickener overflow where a high degree of clarity is desired.

It consists essentially of a specially compartmented sand bed with underdrains, together with a suitable backwash and cleaning mechanism traveling on tracks on the sidewalls of the filter tank and actuated electrically at predetermined differences in head. The filter can be supplied in sizes varying from 3 ft. to 16 ft. in width and lengths to suit local conditions. These lengths usually range from 10 ft. to 100 ft. or more in length. The cleaning or backwash mechanism consists of a motor-driven, slowly moving carriage which operates periodically back and forth over the length of the filter bed. This carriage is equipped with two pumps, one a backwash pump taking the filtrate from the effluent channel, pumping it back through the sand bed, and the other a wash water pump for removing the dirty wash water from the cleaner hood to the wash water launder.

As suspended matter gathers on the surface of the filter bed, the filtering rate is increased and the head in the filter tank begins to build up. At a predetermined level, an electrical contact starts the carriage and also the backwash and wash water pumps. The backwash valve or shoe attached to the moving carriage rides over the effluent ports, the pumps operating as described above. Back washing is usually done at the rate of 10 gals. per sq. ft. per min.

Rubber Check Valve

GROVE REGULATOR Co., Oakland, Calif., has brought out a new "Chex-flo Valve" in which operation is ef-



Showing assembly details of check valve

fected by a synthetic rubber tube stretched over a slotted, cup-shaped metal core. The tube expands to open and contracts to close as soon as balanced liquid flow is reached, eliminating any back flow. Because of this action there is no tendency to establish pressure impulses, shock, or water hammer through the flow line. The self-compensating and wear resistant factors in the unit make it suitable for handling corrosive and erosive gases or liquids.

Caterpillar Scrapers

CATERPILLAR TRACTOR Co., Peoria, Ill., has developed three sizes of open-bowl scrapers, matched in capacity and built to perform with Caterpillar Diesel tractors. The new scrapers, designated as Nos. 80, 70 and 60, have struck measures of 13.8, 8.7 and 6.0 cu. yd., respectively. They are open-bowl design to give greater access for shovel or dragline loading and have double-curved, self-sharpening cutting edges for "live loading" with longer boiling action.



One of three sizes of open-bowl scrapers used with Diesel tractors

Dual Batching Plant

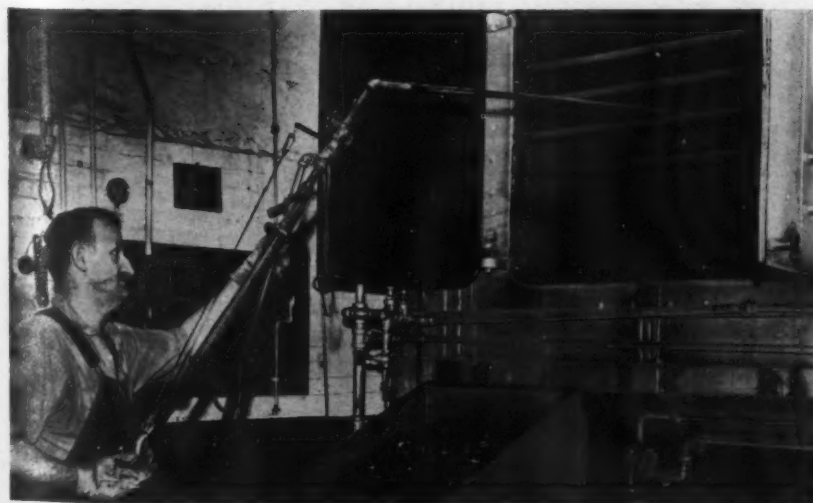
THE C. S. JOHNSON Co., Champaign, Ill., has announced the development of the dual batching plant for aggregates. The aggregate bin is of the portable section type, of 100 cu. yd. capacity, divided into three compartments, with hinged log sections for fast erection and moving.

Two multiple material batchers of 34E paver-batch capacity are so located that a single operator can handle both batchers. Batchers are discharged simultaneously into the separate compartments of two-batch trucks, thus requiring only one spot at the aggregate plant, and effecting a saving in batching cost through reduced man-power and time at the batching plant. A reduction in hauling units also is possible on most jobs, due to the saving in standing time at the plant.

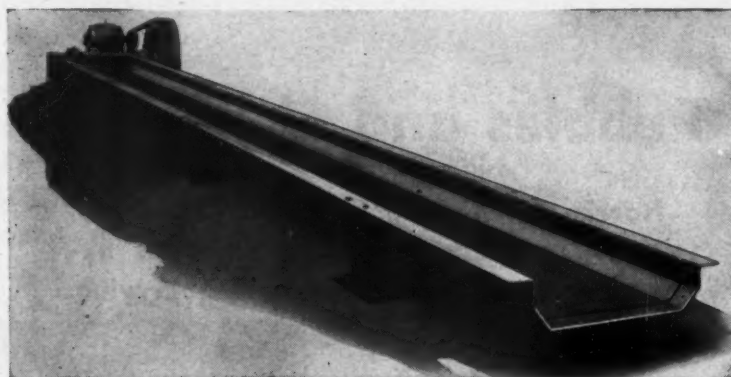
To further increase batching efficiency, dual cement batchers are provided for in Johnson bulk cement plants, including the Dutch mill, the portable section and the twin silo units. The twin silo has also been recently developed to provide storage capacity up to 1610 barrels of cement, and is the largest portable unit in the Johnson line.

Boiler Tube Cleaner

A QUICK METHOD of cleaning boiler tubes with compressed air has been devised by the Educational Committee of the Compressed Air Institute, Cleveland, Ohio. A compressed air line feeds into a length of pipe, at the end of which is a metal disc. At the other end of the pipe is fastened a shovel handle. The length of pipe is inserted into the boiler tubes so that the metal disc dislodges the soot, and compressed air then blows it out. The air is released by a valve controlled by a chain stretching the length of the shovel handle.



Cleaning boiler tubes with compressed air



Conveyor for handling hot, wet or abrasive materials is of the short hanger type

Oscillating-Trough Conveyor

LINK-BELT Co., Chicago, Ill., has announced its oscillating-trough conveyor which is said to be particularly adaptable for handling abrasive, wet or hot material. Although it has been used in foundries, steel mills and machine shops engaged in war work, this is the company's first official announcement that the conveyor has been developed. The rock products industry may find a number of uses for equipment of this kind in handling hot sand, lime, and cement clinker or other applications.

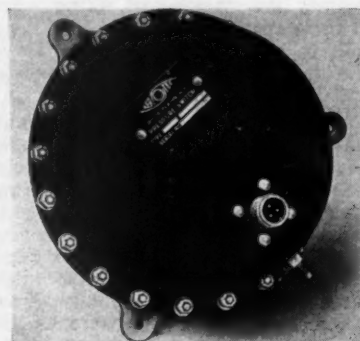
This conveyor consists of a flexibly supported plate steel trough of rectangular cross-section, which is oscillated back and forth by an eccentric drive at a speed that will result in a forward travel movement of 20 to 50 f.p.m. for most materials, depending on the flowability of the material being handled and on the type of unit installed.

It is said that the wear on the trough itself is small; the forward motion of the material merely giving the trough a high polish. Conveying is done in a straight line, but sepa-

ately driven sections of conveyor can be set at angles to each other, with one conveyor discharging into another. Conveying can be on a downward slope or horizontally. It is made in two types; short hanger and long hanger.

Pressure Switch

AEROTEC Co., White Plains, N. Y., has developed three new 8-oz. switches for control, either by pressure or vacuum up to 200 lb., of liquids or gases. Typical applications are in the



Diaphragm type pressure switch

control of compressors or pumps. The switch is rated at 10 amp. on 110-volt a.c., and can be used for any substance that will not corrode brass. The three types differ in that the M-500 has an externally adjustable range with a fixed differential, the M-600 has a manual reset on the outside and type M-700 has an adjustable differential. Pressure connection is by means of a 1/8-in. pipe nipple.

New Masonry Unit Plant

MATHES-VICKERS BRICK Co., Durham, N. C., is planning construction of a new concrete block plant in Durham, to start operations early in 1946. Capacity of the plant will be about 30,000 units per day, to include units made in a variety of colors.

Pebbles and Mill Liners

Harris Granite Quarries Co., Salisbury, N. C., produces grinding media as by-product of monumental stone quarrying.

By H. E. SWANSON

GRINDING PEBBLES and mill liners are now being produced by the Harris Granite Quarries Co., Salisbury, N. C., to fill the need for grinding media created by curtailment of imports of foreign flint pebbles and Silex. Before the war, the flint stones from France and Denmark and the Silex from Belgium were used almost exclusively in mills for grinding feldspar, silica sand, and other minerals. With the cessation of imports, it became necessary to find some domestic product which would satisfactorily replace this essential material, and tests of the granite at this plant showed that the "Balfour Pink" granite was capable of filling many of these requirements. Included herein is a sample chemical analysis of the granite from which the pebbles and liners are made.

Production of the grinding agents was started in 1941 and has expanded until at present, 20 percent of total output is in this type of stone. Granite blocks are cut to correct sizes in the quarry and sent to a grinding plant nearby where the rough edges are removed in tube mills. The mills, three in number, are lined with granite blocks made at this plant. One of

the mills is 5 ft. in diameter and 16 ft. long, while the other two are 3 ft. in diameter, and also 16 ft. long. The pebbles are processed for about 4 to 4½ hours in the mills which revolve about 20 to 25 times per minute, water being added to hold down

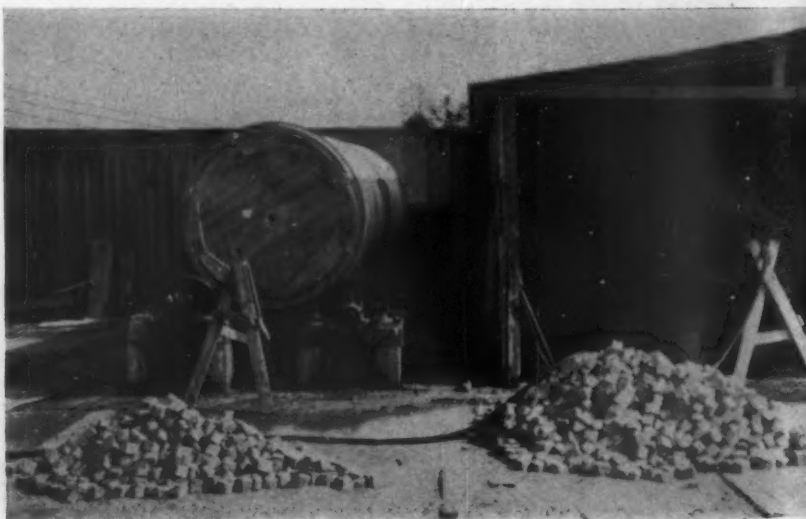
(Continued on page 121)



J. E. Ramsay, vice-president and general manager



General view of granite quarry from which small stone is used to make mill liners and pebbles



Left: Sized and processed grinding media ready for shipment. Right: Two of three mills which grind off corners of pebbles

Convention Reports

Anticipate Big Construction Program

Conventions of National Sand and Gravel Association and Ready Mixed Concrete Association draw record attendance to meetings in Cincinnati, Ohio

APPROXIMATELY 600 attended the first annual postwar meetings of the National Sand and Gravel Association and the National Ready Mixed Concrete Association. The meetings, the 30th and 16th for the two associations, respectively, were held January 22-24 and January 23-25 at the Netherland Plaza Hotel, Cincinnati, Ohio. Convention sessions were scheduled so as to eliminate the problem of concurrent sessions while preserving to a great extent the informality of open-floor participation and exchange of information for which these meetings always are designed.

Both meetings were opened with the usual addresses by their respective presidents and reports of the executive secretary and director of engineering, followed by separate sessions devoted to merchandising, technical problems, business prospects and other important subjects. The Manufacturers' Division of the National Sand and Gravel Association held its annual meeting as well, to elect officers and transact business. The time and place for the 1947 annual conventions commanded much of the attention of the Manufacturers' Division meeting and also the Board of Directors' Meeting of the National Sand and Gravel Association. The place selected is Los Angeles, Calif., and the time will probably be shortly after February 15, 1947, dependent upon accommodations available. Serious consideration is being given to holding the first machinery exposition since the war



R. N. Coolidge, new president, National Sand and Gravel Association

in conjunction with the 1947 meeting.

President Mitchell, in his opening address, said that the National Sand and Gravel Association now enjoys the highest membership in its history. He commented briefly on the industry's recent contribution to the war effort and its essentiality in the reconstruction period. In paying tribute to the Association's accomplishment, Mr. Mitchell said that it is not an ordinary trade association but a valuable department in the business. He particularly complimented the job V. P. Ahearn and Stanton Walker have been doing for the membership in attaining national recognition for the industry. He mentioned the fact that V. P. Ahearn has served as a member of the War Labor Board and as chairman of the Industry Section and that he was a management delegate at the Labor Management Conference called by President Truman to emphasize the kind of recognition attained. He also mentioned that Stanton Walker is serving on some 40 committees having to do with all types of engineering and specification problems concerned with sand and gravel.

Officers (Sand and Gravel)

R. N. COOLIDGE, president of the Cumberland River Sand Co., Nashville, Tenn., was elected president of the National Sand and Gravel Association to succeed Robert Mitchell who has led the Association the past two years. T. E. Popplewell, Fort

Worth Sand and Gravel Co., Fort Worth, Texas, was elected vice-president and H. S. Davison was re-elected secretary-treasurer. The executive committee comprises W. A. Bliss, Pittsburgh, Penn.; Eric W. Ryberg, Salt Lake City, Utah; George W. Renwick, Chicago, Ill.; and A. R. Shiely, St. Paul, Minn. Elected members at large of the Board of Directors were Floyd C. Fuller, Portsmouth, Ohio; J. P. Eyre Price, Scranton, Penn.; Eric W. Ryberg, Salt Lake City, Utah; Stephen Stepanian, Columbus, Ohio; and R. K. Baker, Chattanooga, Tenn.

A fine tribute was paid Robert Mitchell and Alexander Foster, Jr., outgoing presidents of the two Associations, for their outstanding performance in leading the Associations during their terms of office. Mr. Foster enjoys the distinction of being the only past president of both Associations. V. P. Ahearn and Stanton Walker, executive secretary and director of engineering, respectively, of both Associations were also extended appropriate recognition for their outstanding effort in behalf of the membership.

Safety Trophies

In the opening session, with president Robert Mitchell presiding, Consolidated Rock Products Co., Los Angeles, Calif., and Fort Worth Sand and Gravel Co., Fort Worth, Texas, were awarded the Rock Product's safety trophies, as winners of the 1944 annual Bureau of Mines safety competition sponsored by the National



"Bob" Mitchell, accepting safety trophy for Orange Plant, Consolidated Rock Products Co., Los Angeles, Calif.



T. E. Popplewell admiring trophy won by Quigley plant of Fort Worth Sand & Gravel Co.

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Sand and Gravel Association. Consolidated's Orange county plant was winner in the competition for operations with over 100,000 man-hours worked and the Quigley plant of Fort Worth Sand and Gravel Co. was winner in the less than 100,000 man-hours class.

Executive Secretary's Report

EXECUTIVE SECRETARY V. P. AHEARN, in his annual report, reviewed activities of the Association and briefly analyzed federal regulations and restrictions of current interest. As to the owner-driver problem, he cautioned that the industry be aware of its existence and of the obligations imposed in accordance with the status of drivers. If drivers are classed as employees, Wage-and-Hour Law regulations apply and social security payments must be paid; if classed as contractors, someone must pay the 3 percent transportation tax. Mr. Ahearn emphasized that O.P.A. regards such tax as an increase in transportation cost which requires absorption by the employer. During 1945, the Association had been very active in opposing decisions of the Bureau of Internal Revenue that drivers are employees and the burden of proof is now on the Bureau.

Mr. Ahearn urged that more plants participate in the annual Safety Competition which, he said, is one of the most important activities of the Association. The frequency and severity rates for the industry declined markedly in 1944.

In his summary of governmental matters, Mr. Ahearn said the industry had had very good relations during the war with W.P.B. and local draft boards, but that very unsatisfactory relations had prevailed with the W.M.C. He was not too hopeful for immediate availability of machinery and supplies which still are hard to get. C.P.A., successor to W.P.B., has a policy not to issue preference ratings, he said, unless it can be shown definitely that an industry is entitled to consideration before other industries competing for such equipment. An AAA rating may be secured in emergency instances such as when a plant burns down or a plant's ability to supply a veterans' hospital is jeopardized. HH ratings in connection with priorities for homes costing less than \$10,000 do not apply to the sand and gravel industry.

Mr. Ahearn was much concerned over the wave of closed shop union contracts that are being signed, often without consultation, which permits unions to staff plants and is a threat to the upgrading of young men to more responsible jobs. He urged that plants seek Association counsel on collective bargaining matters before signing agreements that may take away management's responsibilities to discipline its employees.

The National Wage Stabilization Board, successor to W.L.B., must approve wage increases if they are a consideration in applications for price relief, and wage decreases are illegal until June 30, 1946, when this legislation ends. He cautioned that unions are claiming, without authority, that increases in wages will warrant price relief.

Mr. Ahearn commented briefly on the Walling ruling (Wage-and-Hour Law) which wiped out the distinction between interstate and intrastate shipments as previously governing whether wage penalties need or need not be paid employees. The Association had worked long and hard to secure correct interpretations in order to be in compliance with the law only to have a ruling made arbitrarily that previous rulings as to what constitutes interstate and intrastate transportation do not apply.

While the meeting was in progress in Cincinnati and as this report is written, Mr. Ahearn received a telegram from Charles A. Horsky, counsel, that the Walling ruling had been upset in a specific case before the 10th Circuit Court of Appeals. In the case in question, E. C. Schroeder Co., producer of crushed stone in Oklahoma had been sued for back wages, charged in violation of the Wage-and-Hour Law. The case was appealed and, at the request of the company, the National Sand and Gravel Association and the National Ready Mixed Concrete Association intervened in the case when it reached the Circuit Court. Mr. Horsky, retained as counsel for the two Associations, was assigned to do the oral pleading in the case, with the aforementioned favorable decision. No doubt the case now will come before the U. S. Supreme Court for final decision.

In further comment on wage rates and prices, Mr. Ahearn expressed an opinion that minimum wage rates

will be raised to 55c per hour and probably will increase to 65c. Companies are not required to file prices, said Mr. Ahearn, in his remarks about O.P.A. O.P.A., in its regulations covering prices for the same class of purchasers, now rules that if a customer persistently had been in a special price classification as of March, 1942, he is entitled to be continued on the same basis.

While price relief has not been granted the industry, Mr. Ahearn said the industry has been complimented on its maintenance of non-inflationary prices. Price controls on building materials are desired because rent control has proven popular. The controls will be extended at least until January 1, 1947, and possibly to July 1, 1947, in Mr. Ahearn's opinion.

Report of Director of Engineering

STANTON WALKER, director of engineering, National Sand and Gravel Association, in his annual report, briefly summarized activities during 1945 and outlined plans for 1946. An enlarged program of activities is to be undertaken with the return from the Army of Fred F. Bartel, formerly associate research engineer. Mr. Bartel's promotion to the position of assistant director of engineering has been approved by the Board of Directors.

Mr. Walker said the arrangement with the University of Maryland, through the Association's Research Foundation, continues to be very satisfactory. The University has an ambitious program to enlarge its facilities, including laboratory facilities available for the Research Foundation. During 1945, activities of the laboratory of the Association were expanded through cooperation with the National Ready Mixed Concrete Association. Delmar L. Bloem was employed as associate research engineer in the field of ready mixed concrete and, through overlapping of research for the two industries, has augmented the staff. Mr. Bloem will exercise immediate supervision over the laboratory work in both fields.

In commenting on 1945 activities, Mr. Walker said that 15 separate series of tests received major attention. Concrete durability is the most pressing problem in the construction field, in his opinion, and a great proportion of the work has dealt with the resistance of concrete to freezing and thawing. The determination of the effect of aggregates, principally coarse aggregates, on the general properties of concrete, has been conducted through laboratory investigation.

The freezing and thawing approach to durability studies has proven to be the most informative, and one finding has been that the moisture condition of the concrete, at the time it



Executive Secretary V. P. Ahearn

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is subjected to freezing and thawing, is the principal criterion of its ability to resist such weathering action. From researches conducted, Mr. Walker said it appears necessary, particularly in the case of thin slabs as in concrete highways, to make provision to keep as much away from concrete as is possible when freezing and thawing is likely to be encountered.

Other investigations have pointed to the finding that the use of richer mixes does not necessarily add to the ability of the concrete to resist freezing and thawing.

Much of the work under way will be carried forward in 1946. One specific project will be an investigation of the resistance to freezing and thawing of concrete made with a number of Connecticut gravels and crushed stones. Connecticut specifications now provide, for the first time, for the use of gravel in concrete pavement construction, leaving only one state in the nation that does not provide for gravel coarse aggregates in concrete pavement construction.

Other projects will include studies of resistance of concrete to freezing and thawing made with sands failing to meet soundness specifications and the effect of air-entrainment in such concretes. The grading on sand for concrete and the effect of air-entrainment in eliminating the need for the finer sizes of sand are up for consideration.

The Board of Directors has approved a laboratory short course on specifications and test methods for mineral aggregates at the University of Maryland to be given to representatives of member companies and details will soon be made available. Also, the Board has approved the preparation of a handbook on sand and gravel for engineers making use of aggregates and those engaged in specification writing.

Railway and Highway Prospects

With E. K. DAVISON, one of the younger executives of the industry presiding, the session on Tuesday afternoon was opened with a paper on "Railway Research in Roadway and Ballast," by G. M. MAGEE, research engineer, American Association of Railroads.

As an introduction he commented on the fact that the development of types of railroad ballast and their methods of use and application have been the result of continued trials with careful observation of service performance. And, while today careful consideration is given to obtaining materials which have satisfactory physical properties, the selection of ballast materials is still largely governed by the availability and economics.

Editor's Note: A more complete report of Mr. Magee's address will appear in the March issue.

Gravel in Bituminous Mixes

F. M. WILLIAMS, engineer, Bituminous Concrete Section, Ohio State Highway Testing and Research Laboratory, contributed a paper on "Ohio States Highway Department Practices in the Use of Gravel in Bituminous Mixtures." An abstract follows:

"Bituminous mixtures may be generally classified as those that are plant mixed and those that are mixed in place. Plant mixtures are, bituminous premixed surface course; asphaltic concrete surface course; hot-mixed, hot-laid asphaltic concrete surface course; cold-mixed, cold-laid asphaltic concrete surface course; cold-mixed, cold-laid asphaltic concrete surface course; cold-mixed, cold-laid tar concrete surface course; tar concrete surface course and oil aggregate surface course. The asphaltic concrete, hot-mixed asphaltic concrete and tar concrete surface course items have corresponding base course items. The mixed in place items are bituminous surface treatment, bituminous road mix surface and bituminous macadam surface course (penetration method). The use of gravel is permitted under all of these items.

"In recent years greater tonnages of plant mixed items have been used in comparison to mixed in place items. During the period from 1930 to 1945, inclusive, the Department purchased more than 7½ million tons of plant mixed bituminous concrete. A total of 50,000 tons, of all types, was purchased in 1930 but nearly a million tons per year have been used on State work during each of the last four years. The amount of plant mixed bituminous concrete containing gravel coarse aggregate varied, during this period, from 1 to 66 percent of the yearly total tonnage. The amount of plant mixed bituminous concrete containing natural sand varied yearly from 25 to 84 percent of the yearly total tonnage.



Robt. Porter, Harry Campbell Sons' Co., facing camera, chatting with Wayne King

"An extensive bituminous concrete plant mix program began in 1930 with a swing away from the sheet asphalt and patented pavement surfaces toward a coarse aggregate surface type. A coarse aggregate surface type is considered, herein, to have the voids in the coarse aggregate just filled or only slightly overfilled with matrix at ultimate pavement density. There have been great changes in the bituminous concrete industry from the 25 tons per hour and hand-placing methods used on a high production job in 1930 to the 120 tons per hour and highly mechanized laying methods used in 1945. There have also been comparable changes in the production of gravel for, and its use in, bituminous concrete.

"At present, three sizes of aggregate for surfacing are used. One of these is also used as a leveling course. The sizes are (a) ¾ to 3/16 in., (b) ¾ to 3/16 in., and (c) ¾ in. to No. 8. One-inch to ¾ in. and 1½ to ¾ in. binder courses are specified as well as 2 in. to ¾ in. size for base mixtures. As few as one or as many as three coarse aggregate sizes in combination with a fine aggregate may be required for a project with base widening and resurfacing or for one of all new construction. A project of resurfacing only would require from one to two coarse aggregate sizes.

Character of Ohio Gravels

"Gravel in Ohio varies widely in particle size, hardness and chemical composition. Most of the commercially available sources have been used in bituminous concrete mixes. They have generally proven to be satisfactory. However, several projects constructed with gravel and natural sand, between 1937 and 1943, failed seriously by ravelling. Some failed very soon after completion, other projects lost substantial amounts of surface gravel from pitting but this failure did not progress to the ravelling stage.

"These failures apparently were produced by a combination of the splitting of some of the coarse aggre-



Chester A. Hogan, Hogan Sand & Gravel Co., Poughkeepsie, N. Y.

CONVENTION REPORTS

gate pieces in combination with the hydrophilic characteristics of a portion of the coarse aggregate. The lithological analysis of aggregate from one questionable source indicated the material to be predominantly sandstone with about 10 percent of quartz and igneous rock and about 7 percent of chert. The Department has specified sodium sulfate soundness (A.S.T.M. C-88) since 1943 to prevent recurrence of the failures. This test will be more generally used under our new specifications.

"In areas where other materials were not economically available the Department has allowed the use of uncrushed gravel of grade A or grade B quality. A relatively small quantity of gravel with grade B abrasion loss has been used. This work has been generally satisfactory although it was used principally on highways with medium to small traffic counts. Surface pitting of the non-progressive type is characteristic of this material.

"The use of 40 percent crushed gravel of grade A quality has been specified for both road mixes and surface treatments since the incorporation of these items into the specifications in 1932. The use of uncrushed grade B gravel has been permitted for road mixes, since March 1, 1939, if so noted on the plans. One-hundred percent crushed gravel has been specified for bituminous penetration macadam from before 1930 up to 1933. The use of gravel was not specified under this item from 1933 to 1939. The specification dated March 1, 1939 permitted 100 percent crushed gravel for all sizes except the $2\frac{1}{2}$ to $1\frac{1}{2}$ in. size.

"Seven sizes of aggregate are used in this work at present. The four surface course sizes are (a) $2\frac{1}{2}$ to $1\frac{1}{2}$ in., (b) $1\frac{1}{2}$ to $\frac{3}{4}$ in., (c) 1 to $\frac{3}{4}$ in., and (d) $\frac{3}{4}$ to $\frac{3}{16}$ in. The two sizes used for choke are (a) $\frac{3}{4}$ in. to the No. 8 and (b) $\frac{3}{4}$ in. to the No. 8. A third size for choke does not allow the use of gravel.

"Gravel, except for siliceous gravel hydrophilic in nature, has been satisfactory for these items. Siliceous gravel is difficult to coat and bituminous films strip off readily in the presence of water. Its wearing characteristics are very desirable. The current and future developments of chemical additives as anti-stripping agents may make it possible to use hydrophilic gravels successfully both in plant and road mixes. In the fall of 1944 the Department mixed some bituminous material containing a chemical additive with silica gravel for a short drag treatment in Jackson County. The additive used was one not generally available during the War. Although the gravel was wet when mixed a satisfactory coating was obtained for the mixing method. The work withstood the severe winter of 1944-45 and on a

recent inspection ravelling was not apparent.

"A bituminous mix program was the major factor in the maintenance of Ohio's highways during the War years. Unsuitable surfaces were re-

surfaced, weakened pavement sections were strengthened and, on a limited scale, unserviceable pavement was replaced. Gravel and natural sand were large factors in the execution of that program."

Durability of Concrete

IN HIS PAPER, "Durability of Concrete in Service," F. H. JACKSON, Principal Engineer of Tests, Public Roads Administration, sounded a warning that the status of concrete as construction material is being endangered by the lack of durability exhibited in many structures of recent vintage. Mr. Jackson's paper was based on surveys made by P.R.A. in the western States to investigate the causes of rapid disintegration and was illustrated by slides to illustrate the types of disintegration frequently encountered. Some 200 structures, from small bridges to complicated grade separations, were examined and the results of the investigations were generalized for the national picture.

Mr. Jackson discussed construction variables, modern versus the older coarser-ground cements, the so-called "alkali-aggregate" reaction and air entrainment as factors, suggested some recommendations for changes in specifications.

Concrete must have more life expectancy than it has exhibited in the last 15 years, or substitute materials, such as wood and steel for bridges and bituminous pavements, will come to the fore, he said. Disintegration was discussed and illustrated as being caused by distinct types of disintegrating forces. The types discussed were natural weathering, chemical attack from the outside (the action of sea water, alkali soils or chloride

salts used for ice removal), expansion by elements from within (unsound cement, expansion of aggregates or due to chemical reaction between cement and aggregates). The characteristics of the nature and extent of disintegration of the several types were discussed in detail.

Mr. Jackson mentioned difficulties with expansive aggregates from the Platte river in Kansas and Nebraska which were responsible for failures within a few years. Blending with other materials has usually satisfactorily solved difficulties such as this, according to Mr. Jackson. He pointed out that when aggregates of unusually high or low thermal coefficient are bound rigidly into concrete by a matrix of widely different coefficient, internal stresses of considerable force develop with temperature changes. The reaction between high alkali cements and certain reactive aggregates, responsible for difficulty on the West Coast, was mentioned. The mechanism of this action is now under study.

Construction variables discussed in their effects on durability were the water-cement ratio, entrained air, segregation of concrete in placing, bleeding and water gain. Having a water-cement ratio too high in certain parts of structures, resulting from faulty placement, has been responsible for some troubles.

Mr. Jackson mentioned the procedure suggested by Dr. F. R. McMillan of the Portland Cement Association to prevent accumulation of a layer of porous concrete in vertical lifts. The process consists of filling in concrete to 2 or 3 in. above the form and leaving the concrete undisturbed for about one hour in order that excess water from bleeding may accumulate. When bleeding has stopped, the concrete is struck off and finished.

In his discussion of air-entrained concrete, which he believes the solution to many problems, Mr. Jackson emphasized that proper control is the key to its successful use. He prefers that the air-entraining agent be added into the concrete mixer within a range of 3 to 6 percent based upon the theoretical weight of air-free concrete. Indirect benefits of air-entrained concretes are the plasticizing effects obtainable particularly in lean mixes, the reduction of bleeding and water gain and reductions in sand that can be made.

In his study of concrete deterioration, Mr. Jackson observed that 67



R. V. Roupe, Coon Valley Gravel Co., Des Moines, Iowa

Post-War Construction

percent of the structures examined, and built before 1930, were free from defects. Only 27 percent of structures examined after that date were so classified. He mentioned the theory that more sulfur trioxide be added in the modern, fine-ground cements, particularly to high tricalcium aluminate cements, which is under examination.

Car Supply in 1946

W. E. CALLAHAN, manager, Open Car Section, Car Service Division, Association of American Railroads, told about railroad facilities for handling freight and plans for improving service in a paper, "Car Supply in 1946." Much of his paper was concerned with statistics on freight movements. The heavy movement of passengers, which in 1945 approximated 91 billion passenger miles, will taper off in May and June, 1946. Freight movements in 1945 approximated 680 billion ton miles, just eight percent short of the 1944 all-time record.

Mr. Callahan drew some interesting comparisons to show how stepped up railroad freight hauling efficiency has enabled the handling of greater volume. During 1920, shippers of sand and gravel loaded an average of 49 tons per car and averaged 57 tons since V-J Day.

Approximately 2,048,000 cars of sand, stone and gravel were loaded during 1942 in revenue freight service as compared with 1,595,000 cars in 1943, 1,087,000 cars in 1944, and 605,000 during the first six months of 1945. The Department of Research of the Association of American Railroads, through analysis of the construction outlook, estimates that 1926 levels will be reached within a few years.

Penalty demurrage regulations were outlined briefly. On box cars, Service Order 369 of the Interstate Commerce Commission requires assessment after two days' free time of \$2.20 for two days, \$5.50 for the third day, \$11.00 for the fourth and \$16.50 daily thereafter as compared with a scale stopping at \$5.50 per day under the regular demurrage tariff. There is also a temporary restriction applying on all freight cars in the Average Agreement Rule of the Demurrage Tariff, whereby two credits are required to offset one debit. This last is the only penalty demurrage regulation applying on open top cars at present.

It is estimated that 242,058 carloads of sand, gravel and stone will be loaded during the first quarter of 1946 or an increase of 1.2 percent over loadings for the first quarter in 1945. The 1946 loadings of these commodities are expected to total about 1,300,000 cars as compared with 1,377,000 cars in 1941.

PAST-PRESIDENT ROBT. J. PORTS presided over a session of both the National Sand and Gravel Association and the National Ready-Mixed Concrete Association at which the main subject was the prospect of the construction industry in 1946.

Public Works

BAIRD SNYDER, deputy administrator, Federal Works Agency, presented a paper entitled "Public Works—A Common Responsibility," some of the high points of which are as follows:

"No other one industry (referring to construction) and its various branches weigh so heavily in the total economic well-being of the American people. It is little wonder, then, that everywhere, and especially in Washington at this time, there is a steadily growing desire to bring about a healthy, expanding, construction industry permanently stabilized at a high level, so far as possible, with the erratic hills shaved off and the dangerous valleys filled in. The violent fluctuations of construction volume which heretofore have characterized the industry somehow must be curbed for the benefit of the country, and for the benefit of the industry itself.

"I hope we have learned some valuable lessons from the depression of the '30's. In F.W.A. we are trying to profit from one of those lessons by stimulating public works planning by the States, counties and cities. We have the authority to do this in the War Mobilization and Reconversion Act of 1944 which authorizes the Administrator to make advances, without interest, for the planning of public works, from such funds as "may be appropriated for the purpose." To put the program into effect the President asked for 75 million dollars. Congress actually appropriated 17½ million. All of that money has been allocated. President Truman asked for an additional appropriation of 50 million dollars and contract authorization for an additional 57½ million. Congress has appropriated only an additional 12½ million, with no contract authorization. Figuring five percent of total cost as the cost of planning, the total of 30 million dollars made available should finance the planning of construction to cost about 600 million dollars. I think we need much more than that."

Mr. Snyder then explained in detail the difficulties in drafting plans for 57½ billion dollars of public works, and how it is the purpose of the Federal Works Agency to withhold public construction, so far as possible, when private construction gives evidence of going forward in sufficient volume. He said: "Public and private work do not compete

with each other, as many people think; rather they supplement and complement each other." To show how housing is dependent on utilities he gave the following:

Examples of Needed Utilities

"For example, Surgeon General Parran of the United States Public Health Service recently reported the need for 5,000 new water systems in the United States, and for extensions or improvements to 6,500 additional water systems. More than ten thousand communities lack adequate sewerage facilities. There is an acute need for 166,000 more general hospital beds, 191,000 more beds in mental hospitals, and 44,000 more beds for tuberculosis patients. Of the three thousand counties in the United States, more than 1,200, with a combined population of 15 million persons, lack a single hospital that meets even the minimum standards for medical care.

"The Governor of Illinois states that 455 communities in that State, including 101 with populations of more than 500, have no public water supply. In the same State 734 communities, 230 with more than 500 population each, lack sanitary sewerage systems.

Program for Labor Relations

V P. AHEARN, executive secretary, made a masterly address on "Development of a National Program." A mere abstract will not do justice to it, so the full address will be published in a later issue, as something of interest to producers in all branches of the rock products industry.

He said (and he was a member at the time) that the War Labor Board decided to go out of business after V-J Day because it had no way to enforce its orders, and the members did not believe in having a U.S. government agency that would be openly defied. When any government reaches the stage where a considerable section of its citizens openly defy it, that government is in a bad way.

Mr. Ahearn thought that the administration policy of high wage scales and low prices had the backing of even conservative members of the administration; that the Secretary of the Treasury, for example, has frankly stated that the only way to liquidate the enormous national debt was some degree of inflation.

The C.I.O. policy, Mr. Ahearn believes, is to favor a strong national government which will issue orders or edicts; to avoid honest collective bargaining; that it is engaged in a political program rather than one to promote collective bargaining.

FEDERAL LEGISLATION

The A.F. of L. on the other hand, Mr. Ahearn believes, is desirous of getting the government out of industry and in favor of a free play for collective bargaining. Nevertheless, the A.F. of L. is responsible for much legislation which has helped put the government in industry.

Mr. Ahearn sees a great war brewing between the two union groups, because in the C.I.O., the skilled laborers are submerged and dominated by the common labor multitude. He thought John L. Lewis had emerged as the ablest labor leader in the country.

The Labor-Management Conference, of which he was an alternate industry member, Mr. Ahearn thought was misunderstood by the public in general. It was not intended to be a super-collective bargaining agency, nor was it expected to develop a formula for the settlement of all labor disputes. It did dramatize the fundamental disagreements and sharpen the issues.

The unions, he thought, were not unwilling to accept any restraints of law; that they had come to look upon jobs as their exclusive franchise. They meet any suggestion of giving a worker the right to choose whether or not to belong with furious opposition.

There are many legislative proposals to place curbs on the excesses of labor unions, or union leaders, but all involve the use of Federal police powers in matters that have hitherto been exclusively within the jurisdiction of the several States; this concentration of police powers in the Federal government is obviously a serious matter.

Labor leaders are against proposed fact-finding commissions if the 30-day cooling off period is attached. They want to be able to pull off "quicker" strikes because they are the most effective. President Truman's own acts show that he isn't ready to, or at least doesn't, accept the fact-finding reports. He, apparently, has staked the prestige of the Presidency on his recommendation of the 18½¢ per hour increase in the automobile industry.

As to the meaning of the present crisis, Mr. Ahearn thought, that if the present free enterprise system in this country is to survive, a way must be found to settle industrial disputes by those immediately involved, without government intervention. We don't want any more governmental powers in such cases; we must guard against any administrative law.

Mr. Ahearn favored tribunals to which all parties may go to argue and conciliate, but not tribunals to issue orders. There is a public interest in all such disputes superior to all others; a way must be found to exercise such public interest, for the public will not long permit violent settlement of domestic issues.

J RUTLEDGE HILL presided at a joint morning session of the two associations for the consideration of federal legislation and control measures. The first speaker was Charles A. Horsky, attorney, who spoke on the subject, a "Program of Associations for Opposing the Walling Ruling" and the status of the Gwynne and Pepper bills. Mr. Horsky discussed the E. C. Schroeder Co. test case which has just been ruled favorably by the Circuit Court, upsetting the Walling ruling and which is reported elsewhere in this issue.

Mr. Horsky said that both he and Mr. Ahearn are ready and willing to help everyone in the industry on questions regarding the Wage and Hour Law and that they will send any information that they have to counsels for individual companies, to assist them in their cases. He also said that the industry should do all possible to support the Gwynne and Pepper Bills, such as writing to congressmen. Otto S. Conrades made a resolution that the meeting go on record as supporting the bills. The resolution was passed unanimously.

The next speaker, H. O. Penn, president, Associated Equipment Dealers, spoke on "The Outlook for Surplus Property and New Equipment in 1946." He stated that we have a tremendous amount of surplus property in the United States, including a great deal of construction equipment. Due to the ambiguity of the Surplus Property act, we have been unable to get much of the surplus into the hands of the public. He stated that there is about 12 billion dollars in consumers goods to be offered and that only about one-and-a-half billion dollars worth has been liquidated. The Act provides that the government has the first choice of the surplus property, the States have second choice, third choice goes to the G.I.'s, and industry comes last.

Mr. Penn said that there will not be much change in design or model of equipment before 1947. He also said that we now have appropriated,

for 1946, some two billion dollars in Federal and State Aid Funds, which will be available by June, 1946, for a highway program. Due to the shortage of engineers, not all of this money will be spent.

Federal Taxes

ROBERT ASH, attorney, spoke on "Federal Taxes in 1946." He said that the outlook for the immediate future was that taxes will not be lower. He said that we now have a national income of 160 billion dollars annually, which is expected to continue in 1946 and 1947. Since we have better than a three and a half billion dollar excess of expenditure over revenue for the last fiscal year, there is little likelihood that taxes will decrease. Tax reduction of any considerable proportions is not likely for many years to come, according to Mr. Ash. He said, however, that there may be a bill presented this year or next which may give some tax relief. In Mr. Ash's opinion, Congress may eventually realize that there is more dollar revenue in lower taxes than in the present high ones. He said that the present tax law is confusing due to conflicting judicial interpretation.

Mr. Ash said that the Department of Internal Revenue is employing some 12,000 new employees, which gives rise to the belief that tax returns will be given more careful scrutiny than in the past. Mr. Ash discussed Sections 735 and 711 of the Internal Revenue Code as well as the Owner-Driver question. He talked about the Grand Rapids Gravel Co. test case in which the decision handed down was that drivers were employees.

Price Controls

WILLIAM L. PRINGLE, Building Materials Price Branch, Office of Price Administration, discussed "Price Controls in the Sand and Gravel and Ready Mixed Concrete Industries." His remarks answered some of the questions that were asked by executives of the industries during the last few months. In answer to the question, "What is the measure of relief possible to members of an industry under present O.P.A. regulations," Mr. Pringle said that relief may be granted to ready-mixed concrete producers under Sec. 16 or 17 of Maximum Price Regulation 592. The question about minimum data required by an O.P.A. office in order to process an application, and the form the application must take, was answered by the statement that data required under either Sec. 16 or 17, are set forth in Sec. 30 of the regulation. A letter requesting adjustment suffices as an application. Regarding the difference between area and individual adjustments, Mr. Pringle stated that



T. C. Nugent, left, Nugent Sand Co., Louisville, Ky., and S. Larsen, T. L. Herbert & Sons, Nashville, Tenn.

Open Forum Discussion on Specifications and Test Methods



Theo. M. Bower, Ohio Valley Sand Co., New Martinsville, W. Va.

area adjustments do not necessarily grant to each producer the amount required to relieve his particular hardship. Some receive less, others more, than under individual actions. When an industry member wishes to make application to secure relief, applications should be filed with the regional office if total sales are under one million dollars annually. If sales are more, applications should be filed with the national office of the O.P.A. in Washington. This applies to section 16. However, under section 17, all applications should be filed with Regional Offices.

Mr. Pringle said that he had been asked "What does an area order for building material dealers cover primarily?" and "Why are such orders necessary, and what is to be gained by them?" He said that Building Material Area Orders are designed to provide dollars-and-cents area prices for all important building material items in each important size and specification. The orders will cover all sales to ultimate users or to purchasers for resale on an installed basis. Ready-mixed concrete area prices will ultimately be included in each area in which it is distributed. Orders are being prepared and issued by district and regional offices. These area orders will spell out the existing general level of prices in the area. This arises from the present scarcity of materials and the ineffectiveness of the type of controls now provided. Replacement of vague ceilings with understandable dollars-and-cents prices will provide a firm basis for more effective control of contractors prices. Area orders will give specific prices understandable to both buyer and seller. Ultimately, the program will assist in halting rising building costs, thereby preventing collapse of the construction industry in a repetition of the post-World War I "boom-and-bust" experience, he said.

EDITOR'S NOTE: The interesting address by Thos. S. Holden on "Construction in 1946" will appear in the March issue of *Rock Products*.

PRESIDENT-ELECT R. N. COOLIDGE presided over an open forum discussion on specifications and test methods—trends and specifications conducted by Stanton Walker. Mr. Walker outlined specifications and new proposals and interpreted them. The subjects covered were those of greatest significance and concern to operating executives, including soundness, deleterious substances, hardness and strength, size and grading of coarse aggregates and the size and grading of fine aggregates.

C. W. ALLEN, Ohio Department of Highways, W. F. Kellermann, P.R.A., and C. E. Proudley, North Carolina State Highway and Public Works Commission had been invited to participate in the discussion as well as members but Mr. Walker's own presentation constituted a thorough and authoritative discussion that should interest all operating men. Unfortunately, space does not permit publication of his paper in full.

Most of Mr. Walker's discussion was concerned with concrete aggregates since portland cement concrete represents the use for which specifications are outlined in greatest detail.

Soundness Tests

He pointed out that most concrete disintegration is not due to the aggregates; proportioning, placing and curing being the principal offenders, but he admitted that aggregates are responsible for an important amount of concrete disintegration. Soundness tests, he said, nearly always have for their purpose the determination of the ability of the material to resist disintegration by freezing and thawing. The sodium sulfate and magnesium sulfate tests are the recognized test methods. Validity of these tests is open to debate in Mr. Walker's opinion. Some specifications place great value on satisfactory service records where unfavorable test results are obtained, or require the tests only if no satisfactory service record is available. Mr. Walker predicted that the next step in specifying soundness of aggregates will be based on freezing and thawing tests of concrete made with them under standardized conditions.

Soft Particles

He described various deleterious materials and gave typical limitations imposed by specifications. He pointed out that there is no agreement between testing engineers as to how to identify soft fragments and that their effect on compressive strength, when present in small quantities is negligible although they may be seri-

ous in other regards. The Public Roads Administration is investigating various test methods for the identification of soft particles. Studies are being made on compression tests for individual aggregate particles, on freezing and thawing tests, surface hardness tests, resistance to impact tests and others.

In connection with hardness and strength, applications of the Deval and Los Angeles tests were discussed. The hardness and strength of aggregate is important particularly in the case of bituminous mixtures and also in railroad ballast and of less significance in concrete.

"Simplified Practice" Sizes

In his discussion of the sizing and grading of coarse aggregates, Mr. Walker discussed particularly the "Simplified Practice Sizes" which are gaining increased acceptance. Some objecting consumers insist that the grading limitations are too lenient while some producers say the provisions for tolerances on under-size and over-size are too rigid. Mr. Walker believes the specifications can be met by a straightforward, single-screening process. He suggested that producers should prepare themselves for the necessity of furnishing separated sizes.

His discussion of the size and grading of fine aggregates, as would be expected, dealt principally with the 50-mesh and 100-mesh sizes. He said that with well-graded sands, adequate workability and freedom from bleeding can be obtained with lesser quantities of fines than for poorly graded ones—the well-graded sands suffer for the sins of the poorly-graded ones. Mr. Walker's survey of concrete sand gradings has revealed that 90 percent of the sources fail to meet the War Department minimum of 3.5 percent minus the No. 100 sieve and 51 percent fall on the minimum of 12 percent minus the No. 50. He strongly favors furnishing a general all-purpose sand plus a "blending" sand to be handled separately at the mixer and has proposed specifications for such sands to a prominent specification-writing body.

In the discussion following, Mr. Coolidge said that deposits in his area are almost entirely of chert, ruled out by tests, but that service records are excellent and the gravel is accepted on that basis. E. K. Davison, Pittsburgh, Penn., who has had considerable experience with impact crushers, said that he has been able to reduce the Los Angeles rattler loss from 38 to 40 percent to 33 percent.

Ready Mix

Faced with Demands for a Variety of Cements

ALEXANDER FOSTER, JR., in his presidential address, plugged for free enterprise as the only way in which good wages with low prices may be attained. Workers in this industry do not face reduction in take-home pay because the industry has remained busy, he said. Mr. Foster said that the country cannot look to Washington for the solution of reabsorbing war veterans into industry, mentioning that age in management is too high and needs younger men.

He prophesied that the industry will be faced with demands for a variety of different cements and a bin problem in proportion. With the present multiplicity of mixes, he said, there was need for work to be done on standardization of mixtures. He also cited the need for production of more uniform concrete to continue to gain in acceptance.

EXECUTIVE SECRETARY AHEARN, in his report, covered legislation and regulatory matters principally. Some of his remarks also were presented before the National Sand and Gravel Association, where they apply to both groups, and they are covered elsewhere in the convention reports.

Mr. Ahearn complimented the membership for its work in building up the finest membership in the Association's history. In talking about the 1947 California convention, he said that when exhibits are resumed they will be on an every other year basis. The matter of safety is extremely important, he said, particularly so because trucks operate on the public highways and the public is being stirred up by the high mortality rates from accidents involving motor vehicles. He paid a compliment to Charles Warner, Warner Co., Philadelphia, Penn., for his work on the Industry Advisory Council of the U. S. Chamber of Commerce in the coordination of the construction industry.

R. C. COLLINS, chairman of the Committee on Merchandising was credited with doing a fine job particularly in the drawing up of sales contracts. With new concerns entering the business, it is to the advantage of the industry, said Mr. Ahearn, that they be good merchandisers of good products.

Individual price relief has no value, he said, but on an area basis it does. He reminded the meeting that pessimism need not govern since price relief can be secured under certain conditions. No formal application for price relief by the industry is to be made. The industry has been allowed

to pass along cement price increases. In conclusion, he presented some statistics on volume of business. The industry produced 24 million cu. yd. in 1942, 15 million in 1943, 11 million in 1944, and was on the upgrade in 1945.

STANTON WALKER, director of engineering, reported on engineering activities including the enlarged scope of laboratory work to be undertaken along with the work of the National Sand and Gravel Association and through the appointment of a research engineer in 1945. A good deal of the work in 1945 was on the subject of air-entraining cements. Nine separate investigations on that subject were conducted and preliminary reports now are available on five. He commented on the advantages of air-entraining concrete that are by-products to the increased durability for which they have been adopted.

There is need for a quick method to measure the amount of air entrained in concrete and work is being done in cooperation with W. H. Klein, vice-president, Pennsylvania - Dixie Cement Corp., toward the development of a method of determination to be derived quickly from a sample of fresh concrete.

Future research will be divided between practical projects of immediate interest and fundamental basic properties of concrete. Studies of different cements in their effects on concrete and the investigation of admixtures for the entrainment of air are two practical studies to be undertaken. Volume changes as affected by



C. W. Shirey, newly elected president of National Ready Mixed Concrete Association

length of haul, mixing time; durability as affected by aggregates; volume changes; and the heat of hydration of cements are fundamental studies under consideration.

Mr. Walker has recommended and the Board of Directors has approved an expansion of research by which the association will sponsor a graduate fellowship at the University of Maryland on a similar arrangement to the one of the National Sand and Gravel Association.

H. F. THOMSON reported on plans for a safety contest for the ready-mixed concrete industry to be sponsored by the National Ready Mixed Concrete Industry. The contest will be on a broad plan to embrace, not only plant safety, but safety on the public highway. There will be two independent contests based on size of operations and two trophies will be awarded on a similar arrangement covering the awards made by Rock Products to the sand and gravel industry. Scoring will be on four bases, points being awarded on the basis of accident frequency at the plant, accident frequency in delivery, public liability rating and property damage. It is expected that a specific outline will be ready to begin in July, 1946.

Officers (Ready-Mixed Concrete)

CHARLES W. SHIREY, Waterloo, Iowa, was elected president of the National Ready Mixed Concrete Association, succeeding Alexander Foster, Jr.; F. P. Spratlen, Denver, Colo., was elected vice-president; and C. Dolly Gray, secretary-treasurer. Elected new members of the Board of Directors were Norman J. Fredericks, Detroit, Mich.; John Murphy, Spokane, Wash.; William Moore, Boston, Mass.; and George C. Eady, Jr., Louisville, Ky. The executive committee comprises E. K. Davison, Pittsburgh, Penn.; T. E. Popplewell, Fort Worth, Texas; Joseph M. Scheinin, New York, N. Y.; and Julius Warner, Cincinnati, Ohio.



C. "Dolly" Gray, Ready Mixed Concrete Co., Indianapolis, Ind.

LABOR RELATIONS

COLLECTIVE BARGAINING problems, the importance of correct procedures in testing concrete and an open forum on merchandising were subjects of a session under the chairmanship of R. C. Collins.

Executive secretary V. P. AHEARN, in his discussion of collective bargaining problems, told of some very unfavorable contracts inadvisedly entered into by individual members which, in effect, mean the surrender of the rights and responsibilities of management. The unions interfere with the workers and, in some cases, the union agent practically requires the payment of license by a company in order for it to operate. Many of these contracts are "paste pot" agreements. Mr. Ahearn urged the membership to seek advice and counsel of the Association before signing agreements which might have these consequences, the Association having a joint labor relations committee with the National Sand and Gravel Association.

Job classifications and specifications and hours of work are some of the variables that need interpretation, he said. For instance it was pointed out that double-time agreements should not be made for Sunday and holiday work unless employees are first required to work during the week on straight time. Vacations with pay being new to the industry, require attention.

Mr. Ahearn said the industry was not subject to the Davis-Bacon Act nor to the wage up limitations imposed on contractors, but an attempt is being made to narrow the gap in wages between the ready-mixed concrete industry and contractors. In further comment, he told of a case involving a contract where the right to discipline a worker required approval from the union business agent. The tendency is in a direction that would make pawns of workers. Some contracts are so written that changes may be made everyday. If a man is called to work and reports only to find no work, he is entitled to "call in" pay, in Mr. Ahearn's opinion. All agreements should be in writing and area agreements are a good thing.

E. HOLE, in commenting, on the payroll week, said that his company, when a man is shifted temporarily to higher pay work gives the employee the immediate benefit of the higher wage. If he is shifted to a lower pay job, the worker is paid the higher wage for the balance of the week.

CHARLES W. SHIRRY has a policy of issuing 52 pay checks or 54 if a vacation is not taken. Special effort is made to provide other jobs if no concrete is being hauled in order to be able to guarantee a worker a job for every day.

JOHN R. DWYER, Cement Reference Laboratory, National Bureau of Standards, in his paper "Importance of Correct Procedure in Testing Concrete," told of the large errors resulting from defective equipment or procedure in testing—from details that may appear minor. He emphasized the need for testing facilities and procedure in laboratories with regularity in order to minimize erroneous results that often prove costly.

He told of errors that may build to as much as 60 percent in the low range of a compression machine and said a 15 percent error in a machine may indicate a correction of $\frac{1}{4}$ to $\frac{3}{8}$ sacks of cement per cu. yd. of concrete. Improper capping of cylinders may result in a 15 percent error and the ageing and planeness of capping is of importance. Worn bearing blocks are a source of serious error. To emphasize, he told of two laboratories on a large government project that differed 500 to 1000 p.s.i. just because a new machine had an improperly machined bearing block. The effect is to lower the strength. A combination of defects may result in an error of 50 to 60 percent. Other factors requiring care are the curing of cylinders and alignment in the testing machine.

Laboratories tested by the Cement Reference Laboratory are identified by tags. Stanton Walker said that the Association laboratory is checked every two years. He said that bearing blocks become convex or concave after a two-year period.

A motion was passed that the problem of better testing of concrete be referred to the Board of Directors for consideration and possible action.

R. C. COLLINS, chairman, presented

a report of activities of the committee on merchandising and there followed a discussion of contracts. Mr. Collins said that at the time the committee was formed, more than 70 percent had no contracts, now over 60 percent use contract forms.

A principal topic for discussion was the matter of waiting time for trucks, particularly important now as Mr. Collins pointed out because the industry equipment is to be taxed to produce. More yardage per truck per day becomes a must. The Warner Co., Philadelphia, is considering discharge hoppers as a solution on small jobs. The Committee is in the process of preparing a list of ten rules for publication in contractors' publications, designed to acquaint users with points to increase efficiency for both parties.

Discussion brought out the danger in providing hoppers with service equipment such as discharge hoppers and it was suggested that a nominal rental be charged for such equipment.

CHARLES P. MALONEY, Sr., Washington, D. C., said that time per load was held down in his operation by having eight loading plants with a limit of 3 or 4 trucks assigned to each job. A plant failure would only throw that many trucks out of use. Another producer charges \$15 for each hour the plant is open on Sundays or holidays. Still another said he has been furnishing discharge hoppers without charge but would have charged a rental now but for OPA price ceilings. This producer has furnished two hoppers on a job, one on the ground and one on the floor of a job. A suggestion was made that prices might be quoted on wheelbarrow jobs with, say, a 20c per cu. yd. reduction if the contractor furnish a hopper. One producer men-

JEFFERSONVILLE

READY-MIX CONCRETE, Inc.

NEW ALBANY

IMPORTANT!

The operator of this truck is allowed a maximum of 20 MINUTES in which to UNLOAD this concrete. If more than 20 MINUTES is required, please SIGN THIS CARD.

Ticket No. _____ Date _____

Time required to unload this truck. Hours _____ Minutes _____

Cause of delay _____

Signature of Contractor or Owner _____

The COST of concrete is governed by the length of the haul and the UNLOADING TIME. Please cooperate with us so that we will not be compelled to advance our prices, as has already been done on other building materials. WE ARE TRYING HARD TO HELP YOU, BUT NEED YOUR HELP TO DO SO.

Card used by New Albany Ready-Mix Concrete, Inc., to eliminate truck delays

tioned that 80 to 90 percent of waiting charges are being collected.

M. G. SOSTHEIM, Ready Mixed Concrete, Inc., New Albany, Ind., said he has eliminated truck delays by 98

percent. He uses an 8 x 10 in. printed placard, reproduced herewith. The superintendent knows that the card goes to his boss and that charges for holding a truck over 15 minutes will be charged to his record.

Proportioning Concrete

PRESIDENT-ELECT CHARLES W. SHIREY presided at the concluding session of the National Ready Mixed Concrete Association. A. T. Goldbeck, engineering director, National Crushed Stone Association spoke on "The Proportioning of Concrete," using slides to illustrate his talk. He described a simple and practical method of determining the proportions of materials to be introduced to make a workable and desirable mix. The method was developed by Mr. Goldbeck and J. E. Gray of the National Crushed Stone Association. This method recognizes the validity of the water-cement ratio compressive strength relationship with certain modifications. It utilizes solid volume calculations and recognizes that the desirability of a variable fine to coarse aggregate relationship, depending not only on the gradation of these aggregates, but also on coarse aggregate particle shape which influences voids. Before going into the procedure of determining the proportions for structural concrete, Mr. Goldbeck talked about the fundamental conceptions used in the method. He described specific gravity and showed how to obtain the specific gravity of the aggregates to be used. From this, he showed how to determine the solid volume and solid weight, which are needed in this method of proportioning materials. Mr. Goldbeck showed tables concerning the dry rodded volume of coarse aggregate per unit volume of concrete and showed how this was significant in the calculations of the amount of aggregate to be used in the mix. He showed charts and elaborated on them showing the number of sacks of cement needed to give certain strengths using various types of aggregates and giving different slumps. He also gave definite examples of how to proportion for a definite strength concrete, using figures to illustrate his method.

Concrete Containing Entrained Concrete

Following Mr. Goldbeck's speech, an open forum was held on "Concrete Containing Entrained Air." This forum was conducted by W. F. Kellerman of the Public Roads Administration and Joseph Barbee, of the Ohio Department of Highways. Mr. Barbee mentioned that an experimental road built with air entraining concrete was constructed in Ohio in 1940. In 1942, four other projects were built. In 1945, specifications were changed to include the use of air entraining cement or an air en-

training admixture in all concrete. It has been noted, Mr. Barbee said, that a strength reduction resulted up to 20 percent but that no failures have been found. Scaling has been reduced appreciably and two surveys have shown a reduction in scaling of 67 percent.

Mr. Kellerman stated that air-entraining concrete has proved more workable, uses less water, and has shown increased resistance to scaling. A manual has been prepared for field engineers to help them determine the amount of air, in the field. A method of determining the amount of air entrained in the concrete has been found whereby the field engineer can make the test with little trouble. This method was borrowed from the Indiana Department of Highways and consists of a device that compares actual unit weight with theoretical unit weight.

Laboratory Studies

D. L. BLOEM, research engineer of the National Ready Mixed Concrete Association, discussed laboratory studies made with air-entraining concrete. He said that a large portion of the work was in studying the effect of entrained air on the compressive strength of concrete. He said that it was found that the entrainment of air in a lean mix allows a greater reduction in water to produce a given consistency than in a rich mix. Another part of the work in the laboratory was a study of what factors in

designing, mixing, and placing of the concrete affected the air content. Richness of mix has an important effect on the amount of air entrained. Leaner mixes entrain more air for the same percentage of admixture than the rich mixes. Gradation of aggregate also has an important effect on air entrainment. By increasing the sand from 26 percent to 50 percent of the total aggregate, the air content was more than doubled. Therefore, concrete containing a large top-size of coarse aggregate, since it requires less sand, will tend to entrain less air than a concrete containing smaller aggregate.

Time of mixing has an appreciable effect on entrainment of air. Data indicate that mixing periods up to 30 minutes have no appreciable effect on air content, but beyond 30 minutes, the air content decreases until at 90 minutes, it is reduced by 30 to 40 percent.

Other factors which govern the amount of air entrained are: temperature, depth of section, and amount of water. The latter, however, has little effect.

Non-Agitating Equipment

D. C. HAY, Kuert Concrete Co., South Bend, Ind., spoke on "Haulage in Non-Agitating Equipment." He stated that the ability of a first rate ready-mixed concrete plant to successfully deliver its product to the jobsite without segregation or bleeding, maintaining desired slump and workability in non-agitating equipment (dump trucks) is of prime importance. He said that in the past year his plant produced and delivered, in a satisfactory manner, in excess of 55,000 cu yd. of concrete in dump trucks. When air-entraining cement came into being, Mr. Hay said that the immediate results noted were that segregation and bleeding were eliminated, a much lower slump concrete was delivered, workability and plasticity were greatly increased; and it was possible to haul the concrete greater distances. According to Mr. Hay the use of end-dump trucks is economically sound and practical.

Mixing Time

R. P. MUMFORD, the next speaker, talked about the "Effect of Time of Mixing". Four tests were made with standard mix designs. Results of the tests were as follows: In test No. 1, a mixer of the inclined axis type was used. Two sizes of gravel, 1½-in. and ¾-in. were used. Sand was graded 15 percent plus over a 50-mesh screen. Mix design required five sacks of cement per cu. yd., 40 percent of gravel to be ¾- to 1½-in. grading, and 60 percent ¾- to ¾-in., and sand to be 38 percent of total aggregates. Type 1 cement was used and one quart of 0.009 percent Vinsol-resin solution per cu. yd. was added to the batch. Net water content was 5.25 gal. per sack of cement. It was found



Jos. M. Scheinin, James A. Norton, Inc., New York, N. Y.

READY MIX

that after mixing for ten minutes, 4.7 percent of air was entrained; after mixing for 25 minutes, 4.1 percent of air was entrained; 35 minutes resulted in a percentage of 3.2; 45 minutes, 2.8 percent; and 60 minutes, 0.7 percent.

Mr. Mumford told of the results of three other tests made with different ingredients and under different mixing conditions, all of which showed a trend toward loss of air with continued mixing.

Central Mixing

ALEXANDER FOSTER, JR. was the next speaker. His talk was entitled "Central Mixing Operations". He gave figures showing the proportions used in mixing concrete for various jobs. He showed the various strengths attained by using different amounts of aggregates, water, and cement. He also spoke on the problem of stickiness in air-entraining concrete. He claimed that little trouble in mixing and discharging was encountered except for one or two occasions in hot weather. Mr. Foster had previously taken up the matter of stickiness with Mr. Walker who canvassed various authorities with varying results. The general trend of opinion was that air-entraining concrete does not stick in the mixer drum upon discharge to any appreciable degree, except when the mix is oversanded. Another opinion received was that temperature and mixing time affect the ease of discharge.

Admixtures

JULIUS WARNER, Richter Concrete Corporation, Cincinnati, Ohio, spoke on the subject "Transit Mixing Operations". He said that about 17 years ago, his company experimented with an admix to obtain greater workability. He mentioned a case where a driveway was poured in two sections, one with normal portland cement and the other section with concrete containing an admixture. The results were that the concrete containing the admixture did not scale or deteriorate while the other section did. Mr. Warner also said that his experience was that use of an admixture offers better control than does the use of air-entraining cement. It also is more economical due to the necessity of less storage space. Mr. Warner stated that the problem of stickiness has been solved by reducing the amount of fine sand and adding more coarse aggregate to the mix.

ROBERT PORTER, Harry T. Campbell Sons Co., Baltimore, Md., was the next speaker. His paper "Effect of Different Cements", concerned tests that were made on six different brands of cement. For each cement, concrete was made with 0, 0.005, 0.01, and 0.02 percent of Vinsol-resin, added to the batch in a sodium hydroxide solution. The significant differences in the amount of air entrained by the different cements are indicated in the following table:

ferences in the amount of air entrained by the different cements are indicated in the following table:

Cement No.	Percent Air Entrained		
	0.005 V.R. %	0.01 V.R. %	0.02 V.R. %
1	1.4	3.1	4.6
2	2.8	5.3	8.6
3	1.8	6.3	8.5
4	3.5	7.3	9.3

5	3.5	9.3	12.9
6	4.8	8.3	15.4

Summing up, Mr. Porter said that in general, from this method of analysis, for air contents up to 3 percent, the strengths were substantially unaffected. For air contents beyond 3 percent, the strengths were reduced about 4.5 percent for each additional percentage of air.

Manufacturers' Meeting

THE MANUFACTURERS of machinery and equipment serving the sand and gravel industry attended the convention in force, notwithstanding there was no exhibit this year. The main interest in this year's meeting to these members of the Manufacturers' Division was, however, the future of these exhibits. It had already been announced that the 1947 annual convention would be held in Los Angeles if possible, or in San Francisco, if not Los Angeles; and it had been assumed that under these circumstances there would be no exhibit in 1947. It developed in the discussion at the meeting that there was considerable sentiment in favor of an exhibit at the West Coast convention, and as the matter now stands, the executive secretary, V. P. Ahearn, is instructed to inquire into the possibilities of obtaining hotel space for such an exhibit.

The majority of the members of the Manufacturers' Division of the National Sand and Gravel Association being also members of the Manufacturers' Division of the National Crushed Stone Association were naturally somewhat exercised over the prospect of the two associations parting company at their annual conventions, which for the past several years have been held in the same city and the same hotel on successive weeks.

Therefore, one of the principal actions taken at this meeting of the Manufacturers' Division was the unanimous adoption of a resolution suggesting to the boards of directors of both the National Sand and Gravel Association and the National Crushed Stone Association that in the years following 1947 the two associations resume the custom of holding conventions in the same city and at the same hotel in succeeding weeks, with what amounts to largely a joint exhibit. It was suggested that this arrangement be made for the 1948 conventions, and to hold such exhibits hereafter only every two years, or specifically only in the years in which there will be no National Road Shows. It has already been decided to hold the Road Shows only every two years, the first to be in 1947. The same resolution was to be presented to the board of directors of the National Crushed Stone Association by the members of its Manufacturers' Division.

The members of the Manufacturers' Division, in their resolution, expressed a willingness to hold "some kind" of an exhibit at any convention either association wants an exhibit; which exhibit held at this in-between conventions, probably would consist of little more than booth space with catalogs and pictures. By holding the exhibits every other year, in-between the Road Shows, all believed a very real exhibit would be possible.

A resolution expressing the sorrow of the members because of the untimely death of Francis O. Wyse, Bucyrus-Erie Co., a vice-chairman and very active member of the Division up to the time of his last illness, was also adopted and spread on the minutes of the meeting.

The other business of the meeting was the election of officers and directors for the ensuing year. The following were elected: Chairman, ABE GOLDBERG, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; Vice-Chairman, E. C. ANDERSON, Kensington Steel Co., Chicago, Ill.; MORGAN R. BUTLER, Butler Bin Co., Waukesha, Wis.; A. E. CONOVER, Robins Conveyors, Inc., Passaic, N. J.; E. J. GOES, Koehring Co., Milwaukee, Wis.; WAYNE W. KING, The W. S. Tyler Co., Cleveland, Ohio; G. K. VIAL, Chain Belt Co., Milwaukee, Wis.

Availing themselves of a previously unexercised right under the constitution and by-laws of the Division, the nominating committee brought in the names of six additional directors (the six vice-chairmen having hitherto constituted the board) who were unanimously elected, as follows: EMORY M. HOUSTON, Bucyrus-Erie Co., Milwaukee, Wis.; RALPH C. JOHNSON, Simplicity Engineering, Durand, Mich.; C. B. LAIRD, Eagle Iron Works, Des Moines, Ia.; J. CRAIG McLANAHAN, McLanahan & Stone Corp., Hollidaysburg, Penn.; R. P. MCKENDRICK, Blaw-Knox Division, Pittsburgh, Penn.; W. A. WIRENE, General Electric Co., Schenectady, N. Y.

L. W. SHUGG, who has in fact been the director of exhibits almost from the inception of those in the sand and gravel industry, was elected to the newly created office of Director of Exhibits, and a suggestion was made to the board of directors of the National Sand and Gravel Association that if possible its constitution be amended to permit the membership of the director of exhibits.

Economical Manufacture of QUALITY LIME

Part VI: Concluding article of series discusses rotary kiln operation

By VICTOR J. AZBE

THERE ARE MANY rotary kilns in production and many good men active in their operation. Some are strenuously trying to better performance of these kilns and efficiency gradually is becoming improved but there is still much that remains to be done. The rotary in itself is a very inefficient apparatus because the hot gases and the lime come only into very imperfect contact, but if such a kiln is equipped with a proper preheater and a proper cooler it becomes a fairly satisfactory apparatus.

However, most rotaries are neither arranged nor operated to gain results that are possible, and there are matters about them which should be known by the engineer and operator, but which are not. Lower fuel efficiency and much lower capacity than need be are the result. Of these, capacity particularly is impaired, while one has less control over fuel efficiency. In respect to capacity, if a kiln of, say, 9 x 175 ft. does not produce 250 tons of lime a day, there is something wrong. This infers that one should obtain a ton of lime for 35 cu. ft. of kiln volume. That capacity can be attained when the many factors controlling rotary kiln performance are understood and are adjusted so that a machine, naturally handicapped, does not operate under a greater handicap than is necessary.

Some of these factors are discussed in the following; some are more important than others, but none of them must be ignored. In an already existing installation, nothing can be done about some of the factors, for example the kiln pitch which often is excessive and limits the speed of rotation which is so important. That should at least be realized and, insofar as possible, counteracted by other means.

Flow of Material

The flow of material through a rotary kiln is proportional to its inclination. If the slope is doubled in number of degrees or fractions of inches per foot, the time of passage will be cut in half when other conditions remain constant. This statement should be modified, in that the flow is not exactly dependent upon the slope of the kiln, but rather more on

the upper slope of the surface of material therein. If, in assuming an extreme case, there is a constriction at the kiln outlet high enough to bring the level of lime to the level of stone at its inlet, regardless of the slope or speed of the kiln, there would be no discharge.

Time of passage through the kiln is directly proportional to the speed of rotation, so excessive flow due to too great an inclination can be regulated by retarding the speed. It may also be regulated by varying the level by means of a choke such as mentioned in the foregoing paragraph.

Time of passage is inversely proportional to the kiln diameter. For a nine foot kiln, time would be 50 per cent less than for a six foot kiln, for any given pitch of material or speed of kiln.

Time of passage, of course, is directly proportional to kiln length, being twice as long for double length of kiln if speed and pitch are the same.

Rate of feed has no effect on time of passage if the kiln is full, but of course it has an effect on the load carried and discharged, which is proportionate to the rate of feed up to the point of rear over-flow.

It can also be said, however, that the rate of feed determines back-end height of stone which, in turn, determines the slope of the material through the kiln and therefore the amount of discharge.

Fig. 26 presents the relationship of depth of material in the kiln to the cross-sectional area of the layer and the load carried in terms of lime by kilns of different length. This divided by capacity per hour gives the kiln time.

Kiln load depends on diameter of the kiln, lime outlet end constriction, stone inlet end constriction and rate of feed.

The limestone inlet end constriction should be the maximum possible without throttling these gases and thus limiting capacity. About 0.1 sq. ft. per ton of lime should be proper, but that depends very greatly on the draft available, and whether it is by fan, or high or low stock and what the dust chamber leakage is.

The lime outlet end should also be

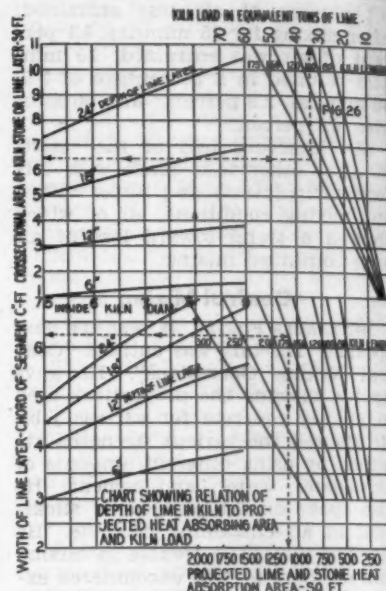


Fig. 26: Charts showing relation of depth of lime in kiln to projected heat absorbing area and kiln load

constricted consistent with practical limitations. Through this constriction, kiln load and so kiln time are increased; wall surface exposure to heat is reduced and lime surface increased as shown in Fig. 27.

The stone feed should be constant and in direct proportion to the kiln rotation, so as to maintain continuously full load of stone in the kiln.

Capacity

Rotary kiln capacity is mainly a factor of the amount of fuel that is burned. The more fuel that is properly burned, the more lime is made.

Amount of fuel that can be burned depends on the amount of air that passes through the kiln, which is a factor of kiln diameter and of draft.

Draft that counts is that inside of the kiln at the feed end and not that in the dust chamber. For maximum capacity it will be high at this end and lower at the discharge end. At low capacity this may be reversed.

If draft is high at the discharge end, it indicates that air is kept from entering the kiln freely, thus impairing capacity.

If draft is low at the feed end it indicates that the kiln may be choked too much or that the dust chamber is plugged, or maybe the dust chamber is leaking, drawing in tramp air at the rear rather than useful air up in the kiln.

Up to a certain point, increasing capacity of the kiln also increases efficiency, although, at any point, with every increase, terminal temperature of the gases will increase. Up to a certain limit, the loss due to this is offset by a reduction in radiation loss as this has a tendency to reduce with increase of capacity. Be-

yond this limit, however, efficiency will decrease with increase of capacity.

Most kilns have a relatively idle mid-section of length. Stone is rapidly preheated at one end and lime is made in the other end. Between these zones, temperature conditions are in an approximate equilibrium with little heat being transferred.

Heat Absorption and Efficiency

When heat is developed in the kiln, its transfer to the lime takes place in several ways but mostly by radiation from the hot flame. The hotter the flame is or the cooler the lime surface is, the greater will be the heat transfer.

Heat is also radiated to the kiln walls, but not as much per unit of surface as to the lime because the walls are hotter. But as there is more wall than lime surface, the proportion the walls receive is considerable.

Some of the heat received by the wall will be conducted through the brick and shell and be lost. Some will be re-radiated to the lime, but this flow is obstructed by the flame and a small amount will be passed to the lime by conduction when it rolls over the hot surface of the rotating kiln.

Heat will also be given to both the lime and the wall by convection, but due to the very limited lime surface and wall surface exposed to the very large diameter stream of gas, there will be very little of this.

The heat transfer by radiation varies as the fourth power of the temperature difference which is of tremendous importance.

For instance, if the hot, radiating gas is 2500 deg. F., and the lime surface 2300 deg. F., 28000 B.t.u. will be radiated per square foot. If the gas is still at 2500 deg. F. but the lime surface only at 2200 deg. F., the radiation rate will increase to 40000 B.t.u., which is an increase of 42 percent.

If the gas temperature is 2000 deg. F., and that for lime 1800 deg. F., the radiation will be 15500 B.t.u. If the lime temperature is dropped to 1700 deg. F. for a 300 deg. F. difference, radiation will be 22500 B.t.u. or an increase of 45 percent.

We must not confuse the surface of layer with the surface of lime. One is the corrugated surface of the layer of lime rolling in the kiln, the other is the outside surface of the individual pieces. This outside surface gathers heat which, due to the temperature differential, is conducted through the lime to the undissociated stone within the piece. The hotter the surface of the lime is, the greater the heat transfer will be. By this is meant "lime surface" not "layer surface."

"Layer surface" may be quite hot while "lime surface" at any kiln cross-section may be comparatively cool. While "layer surface" will always be hotter than "lime surface"

throughout the mass, our interest lies in having the "layer surface" as cool as possible, to increase the radiant heat transfer while keeping the "lime surface" as hot as possible to increase the heat transfer and so obtain quick conversion to lime.

Lime on the surface is heated. Then it rolls under the surface and distributes the heat within itself. Nothing much happens then until the same piece again reaches a heat source.

In a slowly rotating kiln there is considerable time between exposures of lime to heat so the "layer surface" becomes overly hot, reducing its ability to acquire heat, while, in the mass, temperatures equalized themselves, reducing lime-making action. This state can only be counteracted by high speed of rotation.

If the gases are at 2200 deg. F. and the lime at 2000 deg. F., the gases would need to raise only to 2400 deg. F. to double the heat transfer if the lime remained at 2000 deg. F.

So, it is evident that flame temperature is important and the higher the better, within practical limits, but of even more importance is low lime surface temperature. By this, however, is not meant the average temperature of the lime at any point of the kiln cross-section, but rather that on the surface, within sight of the flame, as this lime is mainly receiving heat. According to the fourth power law, it needs be but little less in temperature, to receive ever so much more radiant heat from both the flame and kiln wall.

Lime surface temperature can be controlled only by speed of rotation, that is to bury the surface lime before it becomes heated too greatly and to make it reappear sooner. Then the surface will not be as hot but the average temperature of the mass will be hotter, as the kiln will be absorbing more heat.

But speed controls the rate of dis-

charge and if the kiln would be speeded without substantial outlet constriction, it soon would be discharging core. It also would tend to drop the load and reduce the lime surface exposure and increase the wall exposure to heat, all of which are undesirable.

The solution would appear to be a low pitch for a high speed. However, pitch can also be varied by a combination of heavy discharge constriction, that would assure maintenance of hot zone load to near normal good width, then raising or lowering of the stone level in accordance with the capacity possible. This is shown in Fig. 28. It means a narrower stone layer at the feed end unfortunately, but a wide one at the hot end, together with a lower temperature of upper surface for both lime and stone.

Low Efficiency Operation

It probably would be preferable to compare rotary kiln performance with the worst possible, rather than the best. After all, the majority of the kilns are far nearer to the worst in performance than they are to the best, and for one to find his operation so close to the standard of the worst may serve to emphasize the failings.

As our example here we will take a powdered coal direct-fired kiln, but the reasoning will apply as well to any other rotary kiln, excepting those which may be fired with producer gas, which have certain losses inherent in that sort of operation not here considered.

The poorest rotary has no lime cooler or it has a cooler that is wasting recovered heat. The terminal temperature of escaping gases is 1500 deg. F., or would be this, if determined correctly and combustion would be complete within the kiln and not extend into the settling chamber. If combustion is complete, the stack loss is further augmented by a certain amount of excess air.

The heat energy is of high, also of low intensity. The dissociation temperature of limestone is the division point. This varies with CO₂ concentration adjacent to and permeating the lime layer on the stone. On the average, with small stone for a rotary kiln, it will be less than with stone for large vertical kilns. To assume a temperature of 1500 deg. F. should be fairly safe.

If temperature of the escaping gas from a kiln is 1500 deg. F. and the dissociation point is 1500 deg. F., then all heat for preheating the stone came from the high intensity portion, meaning that none of the heat of low intensity was, or could be, utilized. Also, all heat radiated from the shell all the way to the end was from the high heat source.

There would be no recuperation and no regeneration. All the sensible heat in the lime would go to waste

(Continued on page 110)

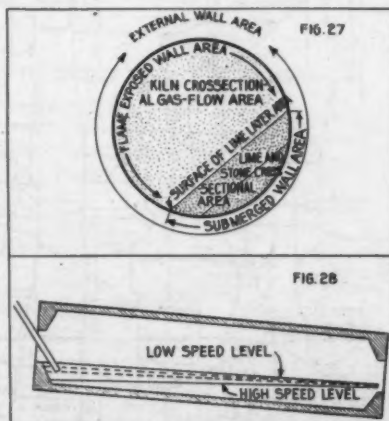


Fig. 27, above: Sketch illustrating various rotary kiln areas. Fig. 28, below: Showing load variation with constant feed at high or low speed of kiln

Operating Trends



Muskogee Materials Co. employs two dredges to reclaim gravel from large bank in Grand River. Tandem system provides better flow to plant than one long pipe line. Second dredge pictured here pumps material a distance of 650 feet to plant

Many new deposits of industrial minerals await development in a State the resources of which have yet to be fully explored

By NATHAN C. ROCKWOOD
and H. E. SWANSON

OKLAHOMA— Favored with Varied Mineral Resources

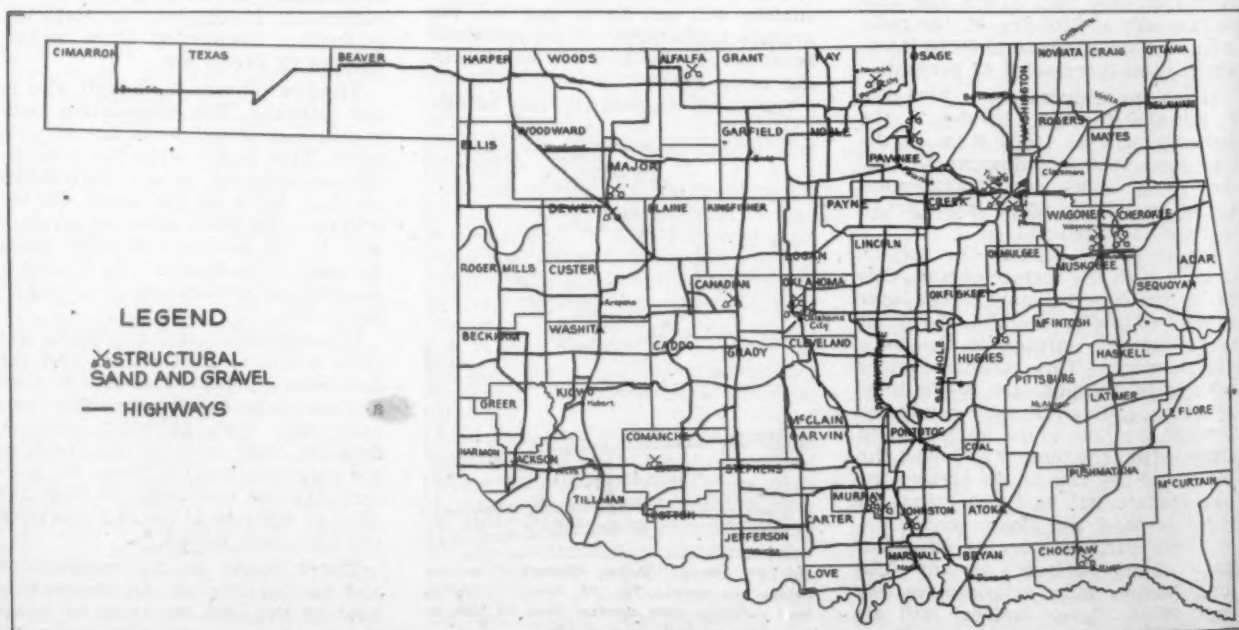
OKLAHOMA has an almost inexhaustible supply of industrial minerals, including sand and gravel, limestone, granite, gypsum, sand and rock asphalt, and many others. The State lies entirely in the Mississippi River Basin and all drainage finds its way to the Mississippi River through two major streams, the Red River and the Arkansas River. The Arkansas and its branches drain about three-quarters of the entire area, while the Red River drains the southern and southwestern parts of the State.

The tributaries joining the Arkansas River from the west and northwest are typical streams of the Great

Plains and have their source in the foothills of the Rocky Mountains, far to the west. These streams, as well as the Arkansas River, are sand-choked, and the waters are heavily charged with sediment, imparting a characteristic red color to the streams. Huge amounts of sand are carried down during flood periods and sand plants located adjacent to the rivers always have a supply from which to draw. Areas from which sand is taken fill up again almost immediately.

Verdigris River, flowing from the north, joins the Arkansas near Muskogee. This river rises in Kansas and flows through most of its course on

a bedrock of clay shale, so that the colluvial material which predominates is mud. It is markedly different from the Arkansas River in that there are no sand bars nor sand-choked channels. The Grand River, which joins the Arkansas near Fort Gibson, flows through a region of chert and limestone hills, consequently, practically no sand is carried by this river. However, large deposits of gravel are formed at the mouth of the Grand River, as well as along its length, in the form of bars. Thus, sand plants are located on the Arkansas River, mostly in the vicinity of Tulsa, and gravel plants on the Grand River.





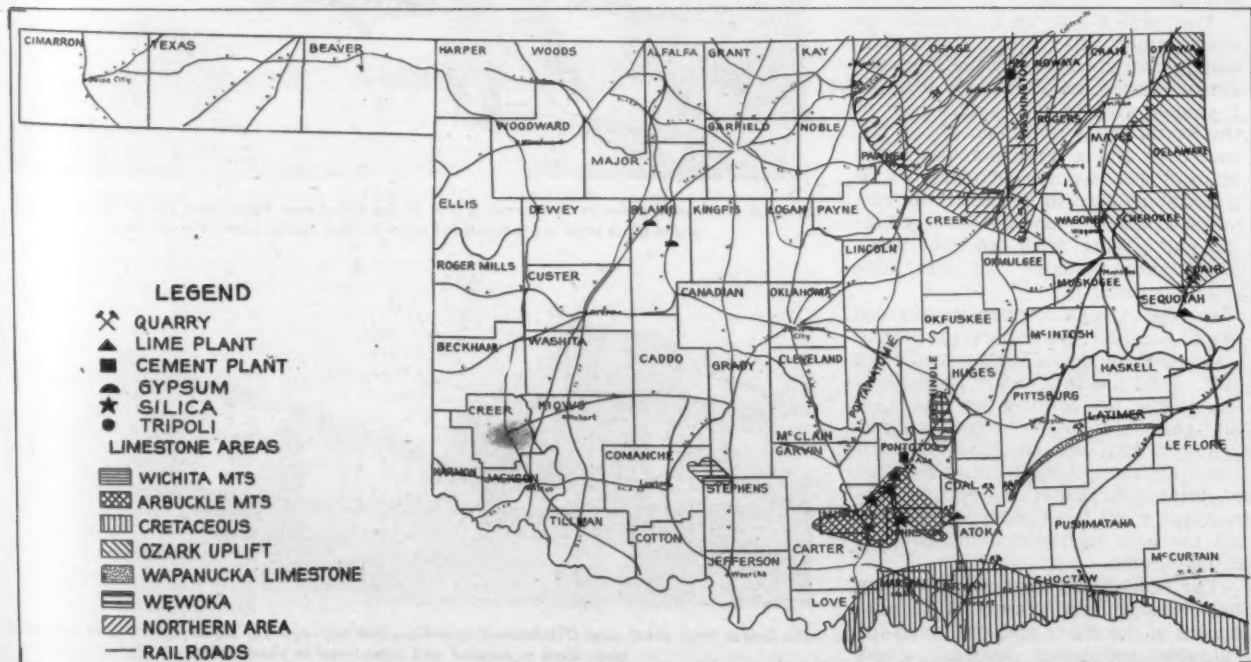
Limestone quarry of the Oklahoma Portland Cement Co. at Lawrence. Stone is shipped by rail to plant at Ada

The best picture of the geologic structure of Oklahoma can be obtained by visualizing the four mountain areas, the Ozarks in the northeast, the Ouachitas in the southeast, the Arbuckles in the south-central, and the Wichitas in the southwest. The rocks in each of these areas are greatly folded and faulted. Rocks underlying the Ozark uplift belong to the Boone formation, a series of cherts and limestones of Mississippian age. The bedrocks of the Ouachita Mountains, sometimes known as the Kiamichis, consist of a great thickness of shale and sandstone with considerable chert. Limestones are almost absent from this area. Rocks of the Arbuckle Mountains consist of a central core of pre-Cambrian granites and related rocks surrounded by steeply-dipping strata of Paleozoic sedimentaries. The rocks of the Wi-

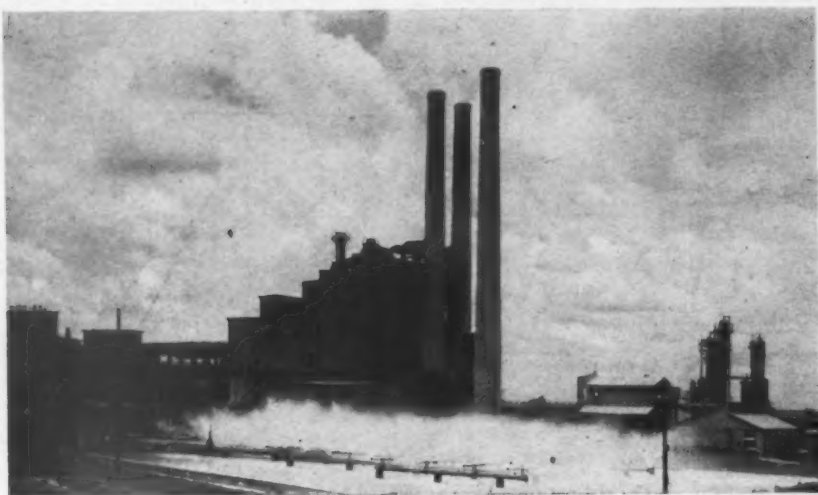
chita Mountain region are of the same general nature as those in the Arbuckle region. Nearly all of the hills forming the group are composed of granite or other igneous rocks.

Little is known about the history of Oklahoma before Paleozoic times, as the rocks of the Archeozoic are exposed only in small areas in the Arbuckle and Wichita Mountains. The area of the State appears to have been a land surface for a great length of time before the Cambrian period and during the early part of that period. After the middle of the Cambrian period, the sea advanced over most or all of the area, and sand and mud were deposited in the shallow waters which covered the old land surface. During the Ordovician, Silurian and Devonian periods, the area of Oklahoma was mostly covered by shallow waters.

During the Mississippian period, the sea probably covered all of the region and rocks of considerable thickness were formed. During Pennsylvanian times, the region stood near sea level so that there were great swamps in which vegetation accumulated to considerable thickness. At or near the close of the Pennsylvanian period there were great movements of the earth's crust which resulted in the folding of the sedimentary rocks, and in some cases the force was great enough to cause faults in the rocks and shove them over one another for great distances. The four mountain ranges named previously are the remnants of domes which were made in the rocks at this time. During the Permian period, the eastern part of the State was probably land. At the close of the Paleozoic period the area was all



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Cement plant of the Oklahoma Portland Cement Co. at Ada. Note dry ice plant to the right

land and remained so during the Triassic and Jurassic periods of the Mesozoic. Although during lower Cretaceous times, the sea advanced from the south and covered the southern and western parts of the State, this submergence was short and before the end of the Cretaceous times, all of Oklahoma was land and has remained so to the present, so that erosion has been continuously at work reducing the rocks to soils as they are known today.

During a part of the Cenozoic era, the Rocky Mountains stood higher than today above the land to the east of them, and vast quantities of gravel were carried down by floods. Considerable deposits of these gravels, made up of water-rounded quartz pebbles and coarse sands, are found in the northwestern counties of Oklahoma.

The system of rocks which are most important from an economic standpoint, are those of the Pennsylvanian period, which occupy a broad L-shaped area in the eastern part of the State. These rocks contain all the coal beds and a large portion of the oil and gas deposits. The shales of the system furnish much of the raw material used for clay products, building and paving brick, and the limestones are valuable for the rock products industry.

Rocks of the Ordovician system also are of considerable importance, for in them are found the commercial high silica sand deposits, many hard limestones that are crushed for aggregate and ballast, the worked rock asphalt deposits, high calcium limestone and shale for cement, and limestone that is suitable for lime. In addition, Ordovician rocks in subsurface generally are the best reservoirs of oil and gas in Oklahoma.

The Oklahoma Geological Survey has worked very closely with producers in the State and has given invaluable assistance locating areas

suitable for various types of rock products production. Material pertaining to tests and data worked up by this department are available to anyone interested.

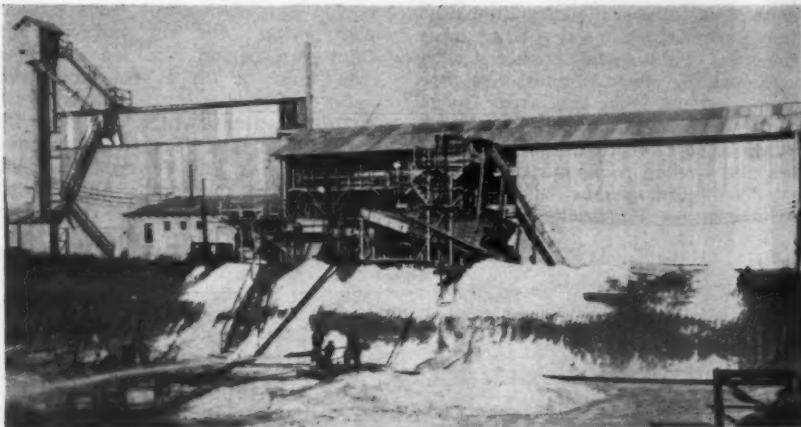
Oklahoma has an almost inexhaustible supply of gypsum but remoteness from fuel and markets necessitates dependence on local markets or stiff competition with mills located closer to the larger markets. Conse-

quently there is only one producing plant in Oklahoma, that of the United States Gypsum Co., at Southard.

The gypsum deposits in Oklahoma are part of an area which extends from central Iowa across Kansas, Oklahoma and Texas. The most extensive deposits are in Oklahoma where the gypsum is included in the redbeds of the western half of the State. These beds consist of red shale and sandstone with the gypsum forming but a small part of the section. They belong to the Permian period.

At Alva the redbeds are about 1100 ft. thick. South from Alva to the center of the State, the beds thicken rapidly, and from the center to the west line, they are about 3000 to 5000 ft. thick. Much of the Permian and all of the Pennsylvanian in Kay County is non-red. Near Shawnee, the lower Permian rocks and 1000 ft. or more of the uppermost Pennsylvanian, a total of more than 3000 ft., are red.

The Blaine formation is the most important gypsum-bearing formation in Oklahoma. It is well developed near Watonga. The U. S. Gypsum Co. has its plant just northwest of Watonga, and Universal Atlas Cement Co. operates a quarry north of this town.



Newest glass sand plant in Oklahoma is that of the Oklahoma Silica-Sand Co. at Hickory. High-grade glass sand is produced for several glass manufacturers in the state



The Doles Bros. plant near Oklahoma City utilizes belt conveyor for movement of sand to storage bins. Sand is washed and dewatered in plant at left

SAND and GRAVEL from River Deposits

IN DIRECT CONTRAST to areas covered by the glaciers, where sand and gravel can be recovered in a single operation, Oklahoma plants reclaim sand and gravel separately, as a general rule. This is due to the deposits formed by rivers which flow through different types of geological areas. Flowing from the northwest and west are rivers and streams which join the Arkansas River, one of the two main rivers in the State. These tributaries carry large amounts of sand and are sand-choked to a depth of 30 ft. in some places. The rivers which flow through the chert and limestone beds to the north and northeast carry gravel and very little sand, consequently recovery from these streams is for gravel and not sand. At the junction of the Arkansas and the Grand Rivers, near Fort Gibson, plants within a few miles of each other reclaim sand in the Arkansas and gravel in the Grand Rivers. South of the junction, both sand and gravel can be reclaimed.

Northwest of the junction of the Grand and Arkansas rivers in Tulsa County, several plants on the Arkansas River are producing sand taken from the river by dredging operations. At present there are eight plants in the Tulsa area alone, producing an average of 30,000 cu. yd. each year. With plants located throughout central Oklahoma, the Dolese Bros. produce sand from deposits located near rivers and process it for local consumption.

Ozark Mountain Region

In the Ozark Mountain region, the Boone formation, about 300 ft. of limestone and chert, is most prominent. This formation forms the upland between the Grand River and the Arkansas-Missouri line. As a result of weathering and erosion by a network of streams east of Grand River and north of the Arkansas River, a great amount of gravel is found on the surface. Sand is found along the Arkansas River with gravel at the mouths of its tributaries. Material found in the Grand River is mostly gravel. Located just north of the junction of the Arkansas and Grand Rivers, the Muskogee Materials Co. and the Yahola Gravel Co. are operating plants.

Ouachita Mountain Region

Although sand and gravel is not as plentiful in this region as in the Ozark Mountain region, it appears to have been deposited in much the same manner. The more turbulent mountain streams contain gravel on the upper reaches and sand on the lower. In several of the counties, there are large deposits of sand and

gravel which were formed by stream action, or in the case of more heavily clay-bound pits, by weathering and decomposition of the old rock formations. Sands and gravels in this region are mostly derived from chert, and the material obtained from this lower southeastern part of the State has been used for gravel surfacing and some concrete work. The pit gravel is usually too dirty for concrete aggregate but washing equipment could make it desirable for any type of construction. Pits in this area take care of local needs more than large production for shipment to other parts of the State.

Arbuckle Mountain Region

Igneous rocks, cherts, limestones, sandstones, and shales are exposed in the Arbuckle Mountain region in the south-central part of the State. The Washita River cuts through this area, and numerous deposits of sand and gravel are found along the mountain streams. Considerable lime-

stone gravel is found in the main part of the Arbuckle Mountains, and sand and gravel from this area has been used for all types of concrete construction. Located in Murray County, near the town of Dougherty, is a sand and gravel plant operated by the Makins Sand and Gravel Co.

Wichita Mountain Region

The Wichita Mountain region is similar to the Arbuckle Mountain region, except that the predominant stone is granite, consequently most of the sands and gravels found here are of granite origin. Sand and gravel has been produced commercially from this area but at present only local needs are met, since the deposits would not warrant the construction of large commercial plants.

Permian and Tertiary Region

This area surrounds the Wichita Mountain region. The Tertiary deposits are made up of a mixture of sand, clay and gravel, often cement-



Typical of the sand operations in the Tulsa area is the plant of the Tulsa Sand Co. Sand is pumped by dredge to washing plant



At the Yahola Gravel Co., Fort Gibson, material is pumped to a sump where mud is washed away. Scraper at left takes washed gravel to conveyor to screening and crushing plant

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ed by lime, and are found in the extreme western and Panhandle counties. Although the materials found here are suitable for highway construction, little use has been made of them, and local needs are all that have been met.

Glass Sand Regions

Oklahoma is rich in sands suitable for glass manufacture, having areas of high grade glass sand in the Simpson formation of the Arbuckle Mountains; the Trinity sands north of Red River in south-central and southeastern Oklahoma; and a small area in the Burgen sand near Tahlequah in the northeastern part of the State. The most important source for glass sand is in the Simpson formation, where four plants are now producing. This formation consists of 1200 to 2000 ft. of sandstone, fossiliferous limestone and interbedded shales. The total thickness of the glass sand deposits is about 600 ft., and they are found in four well-defined beds of the formation. Most of the area contains sand which is high in silica and low in iron content, such as the recently opened pit of the Oklahoma Silica Sand Co. at Hickory, where the silica content reaches about 99.8 percent and iron content is well below 0.03 percent. Mid-Continent Glass Sand Co. at Roff produces a high grade sand, but since some of the formation contains an excess of iron, beneficiating methods including concentrating tables and flotation cells are used. The finished product is ideally suited for high grade glass manufacture.

Sand Asphalt

The largest deposit of sand asphalt occurs along the banks of Sandy Creek near Ada. Commercial deposits are local, however, since the liquid asphalt which forms the cementing material seeps out, thus making the percentage of viscous asphalt low. The more important, though smaller deposits occur near Woodford and south of Ardmore, where the sandstone has been impregnated with asphalt and is suitable for road construction. Rock asphalts, that is limestone and sandstone impregnated with asphalt, together with sand asphalt, have been used extensively in paving. The majority of the roads in Oklahoma are paved with asphaltic materials, and only a minor portion, about 15 percent, are constructed of concrete. Sand and rock asphalt are produced near Dougherty by the Southern Rock Asphalt Co., Oklahoma City.

Caliche

The use of caliche for road surfacing began around 1933 in Oklahoma. Cheapness and availability as contrasted with other types of surfacing material, which had to be shipped in from great distances, led to its use. Its utilization is restricted

to areas where climatic conditions are favorable, such as the Panhandle region, which is the area in which the formation of caliche occurs. Rainfall or low temperatures would soon destroy the caliche base course or top surface of a road.

Caliche is a porous, earthy, calcium

carbonate containing impurities of soil, sand and gravel, which occurs widely at the surface or at shallow depth in the soil. Deposits in Oklahoma occur in late Tertiary and Pleistocene beds of the Panhandle region and have their approximate distribution over Cimarron, Texas, and

County	1/4-in.	PER CENT RETAINED ON TESTING SIEVE			
		No. 20	No. 50	No. 100	No. 200
Alpha	4	47	39	6	2
Alpha	5	36	44	11	2
Beaver	4	32	52	9	4
Beaver	5	26	54	10	4
Blaine	9	35	42	8	
Blaine	12	22	8	16	22
Bryan		30	51	14	
Caddo		33	51	10	4
Canadian		31	51	16	2
Canadian	7	21	49	13	4
Cimarron	2	47	37	8	6
Cimarron	11	27	50	10	1
Cimarron	8	21	51	14	2
Cimarron		27	59	11	3
Comanche	0	34	50	13	2
Cotton	6	50	39	4	
Dewey	6	37	55	4	
Dewey		45	41	11	2
Dewey	2	27	49	17	4
Ellis		72	16	3	9
Ellis		28	60	9	3
Garvin	8	48	41	2	
Garvin	6	50	32	8	4
Garvin	4	66	28	2	
Garvin	0	45	45	10	
Grady	1	20	64	13	1
Grady	1	23	60	14	1
Harmon		27	60	10	3
Harper	3	28	57	9	3
Harper	3	32	48	15	2
Johnston (granite)	5	56	32	5	1
Johnston (granite)	3	57	38	1	1
Johnston		44	32	20	
Johnston	8	25	50	9	2
Kay	2	68	11	3	
Kay (washed)	18	68	11	3	
Kay (washed)	1	35	43	20	
Kay	1	47	44	8	
Kay		28	57	5	1
Kay	2	39	39	19	1
Kingfisher		31	55	11	2
Kiowa	12	32	35	16	3
LeFlore		26	52	18	1
McIntosh	13	77	7	3	
Major	4	43	46	6	
Major	2	23	50	15	2
Marshall		38	53	9	
Murray	1	43	35	16	4
Murray	7	59	30	2	2
Murray		57	34	6	1
Muskogee		35	48	17	
Okfuskee	2	27	57	13	1
Okfuskee	1	31	51	16	1
Oklahoma	2	48	35	6	
Oklahoma		25	55	17	2
Oklahoma		26	63	7	2
Osage		26	68	5	1
Osage		31	58	10	1
Osage		38	51	9	2
Pawnee	4	48	44	4	
Pawnee	16	63	19		1
Pawnee	7	53	37		3
Pawnee		60	35	4	
Payne		28	36	13	3
Pittsburg		28	47	19	
Pottawatomie		20	55	11	1
Pottawatomie		44	44	10	
Pottawatomie		38	47	9	4
Pottawatomie		27	50	18	5
Pottawatomie		34	60	5	
Texas	2	28	65	4	
Texas	4	35	49	9	3
Texas	10	41	39	7	
Texas	1	28	58	10	
Tillman		31	47	15	4
Tulsa	0	29	30	17	4
Tulsa	0	29	54	15	
Tulsa	0	27	55	15	
Wagoner	3	29	52	15	1
Woods	5	50	39	3	2
Woods	12	55	28	3	3
Woods	8	34	45	9	
Woodward		22	60	13	2

Beaver Counties, and parts of Harper, Ellis and Woodward Counties. It lies at the surface or just below the surface of the High Plains over this area. The individual beds range from a few inches to several feet in thickness, each bed showing great variation in character.

The value of caliche for road surfacing is based on the nearness of the deposits to roads to be surfaced and the quality of the deposit. The cost of quarrying varies with the deposit, tough and hard caliche requiring blasting. The best deposit found in Oklahoma occurs adjacent to Guymon and Optima in Texas County. It is hard, tough, crushes readily, and has a relatively low plasticity index, liquid limit and other desirable features of low moisture absorption.

How Caliche Is Used

The general practice in applying caliche to roads is to spread it in two layers. The first layer is applied, spread evenly, and saturated with water to make it set. It is then rolled to a smooth surface and the second layer applied in a similar manner. The base course must be smooth and even, as caliche pits and forms chuck holes easily.

Several small pits have been opened in the Panhandle region to quarry this material for local use.

The Emergency Relief Administration made a construction materials survey of Oklahoma in 1934 and its Report on Sand and Gravel was published in December of that year. This report lists sources of sand and gravel and attempts to show what the materials may be used for. In the instances where the sand is stated to be good for concrete, and where screen analyses are given, we have tabulated results as shown here. In most instances, apparently these are screen analyses of the raw material, although in a few instances, they are plant products. The percentages do not add up to exactly 100 in many instances because both finer and coarser material was included in the original analyses.

Sand Analyses

Using No. 20 as the critical size, the Grady County sand with a total of 79 percent passing appears to be the finest; the McIntosh County sand with only 10 percent passing No. 20 is the coarsest. There is a difference of 70 percent in the amounts retained on the No. 20 sieve. On the basis of these sieve sizes, a good concrete sand should have between about 25 and 55 percent (cumulative) retained on the No. 20. The 81 sands, the average sieve analysis of which is plotted on the chart, page 101, are plant products, not raw material which shows that Oklahoma sands are being processed to provide very excellent concrete fine aggregate.



Looking down the bank from primary crusher to storage bins at the plant of the Standard Paving Co., Gray, Okla. Advantage was taken of location to make use of gravity flow of stone from primary crusher to succeeding screening and crushing operations

Stone Deposits of Oklahoma

NATURE has endowed Oklahoma with great resources of stone, of which the limestones and dolomites are the most important commercially for construction work. The limestone areas are located in the central and eastern parts of the State and will be described in their individual locations.

Northeastern Area

The limestone area of northeastern Oklahoma lies in the Ozark Uplift, with the greater part in the Springfield Plains and smaller portions in the Prairie Plains and the Boston Mountains Plateau. Counties covered by this region include all of Delaware and Adair, the east half of Mayes, the southeast half of Ottawa, the northeast half of Cherokee, and the southeast half of Craig, and extends into northern Sequoyah, eastern Wagoner, and eastern Muskogee Counties.

Most of the region is covered by Mississippian rocks, and in many places streams have cut through to expose older Paleozoic rocks. The entire region is folded and faulted, with the faults having a general northeast-southwest trend. Among the several limestones outcropping here are the Boone, Mayes, Fayetteville, Pitkin, and Morrow.

Much of the Boone formation is chert, stratified and in layers. It can be used for building stone, although little has been quarried. Lead and zinc ores are contained in this formation in the northeastern part of the State, and the crushed material, composed of chert and limestone, and known as chat, is put to commercial use by plants in Miami and Picher. The chat, which is angular and durable, makes good road material, and is produced in large quantities by the Miami Rock Products Co., the Baxter

Chat Co., and the Eagle-Picher Lead Co., all located in this area.

North of Sallisaw, in Sequoyah County, are outcrops of St. Clair limestone of Silurian age, which consist of massive-bedded, coarsely crystalline, white to pink stone, some beds of which are dolomitic. These outcrops form a rather sinuous belt northwest of Marble City. The sedimentary rocks in the Marble City district range in age from Silurian through Pennsylvanian, and consist of limestone, dolomitic limestone, cherty limestone, shale and sandstone. Part of the St. Clair limestone undoubtedly has been cut away by erosion at the top of the formation, but such erosion has not affected the chemical composition or quarrying possibilities of the stone that is still present.

All exposures are dependent on two factors: uplift by faulting, and erosion. Uplift along the faults has displaced the sedimentary beds about 500 ft. vertically, and thus older beds which normally lie at depths of several hundred feet have been brought to the surface on the upthrow side of the faults. Later erosion by streams flowing across these uplifted areas has worn away the overlying strata and exposed the St. Clair. Dips are relatively low, and the flatness of the dips make for ease in quarrying. Chemical analyses show that this formation has a low silica content, ranging from 0.039 to 0.36 percent, and iron oxide from 0.04 to 0.183 percent. The lowness of the silica content makes the St. Clair limestone one of the best chemical stones in the world in this respect. The compressive strength is high enough for most purposes, and is suitable for building stone, and also strong enough to support the charge in a blast furnace.

The outcrop covers an area of about 600 acres, and is exposed along

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the sides of rather steep hills, in stream valleys, and on terrace-like benches that occur in a few places. Most of the quarries are located on hillsides, or on shoulders that project from them where the slopes are gentle and there is little overburden. On the slopes, at least 65 ft. of high-calcium limestone is exposed above the ground in three quarries: the St. Clair Lime Co., the Independent Gravel Co., and an abandoned quarry.

About 1937 the Independent Gravel Co., of Joplin, Mo. began production of aggregate and agricultural limestone, first utilizing the spalls and fines derived from quarrying for the lime kiln, and later opening a separate quarry. About the same time, the Dunlap Co. of Oklahoma City, on information received from the Geological Survey, selected the area for stone suitable for the company's kiln at Oklahoma City, and shortly thereafter reorganized as the St. Clair Lime Co. Since the stone offered such great possibilities, another plant was soon opened at Sallisaw by this company.

While the Boone formation is the most important commercial limestone in the northeastern area, other limestones occur here, including the Mayes, which is principally a dark gray to black stone, and is almost pure calcium carbonate, low in silica. The outcrop occurs in a narrow band from the Kansas line in north-central Ottawa county through the central part of the county, across the southeastern corner of Craig, and the central part of Mayes county. The thickness shows considerable variation, ranging from about 3 ft. in some areas to 100 ft. in others, averaging about 40 ft. Little commercial use has been made of this limestone.

The Fayetteville limestone is usually limited to a single member near the top of the formation, and is a hard, blue stone ranging in thickness from 10 to 15 ft. This stone is not

pure and has a fairly high silica content. It is not important commercially.

Occurring in numerous small outcrops, often brought to the surface by faulting around the edges of the Boone area, is the Pitkin limestone which occurs along both sides of the Grand River in Wagoner, Mayes, Craig, and northern Delaware and Ottawa Counties. The outcrop covers an area of about 360 square miles, and ranges in thickness from 10 to 80 ft. Chemical analyses show this stone to be comparatively pure calcium carbonate suitable for lime, crushed stone, or cement production although little use has been made commercially.

The Morrow formation occurs in isolated outcrops in thicknesses from 100 to 120 ft. ranging from a nearly pure calcium carbonate to a highly siliceous phase. Although the limestones in this formation have commercial possibilities, no large scale operations have been carried out in them.

Northern Oklahoma Area

The limestone area of northern Oklahoma includes all of Osage, Washington, and Nowata Counties, the western half of Craig, northwestern half of Rogers, northern part of Tulsa, extreme eastern part of Creek, northeastern half of Pawnee, and the eastern part of Kay Counties. The region is roughly triangular and embraces an area of about 5500 square miles. Locally, the topography varies. Sandstones and shales predominate in the eastern part, and form steep eastward-facing escarpments with gentle west slopes. Most of the western part consists of alternating beds of limestone and shale which form a rolling plain broken by eastward-facing escarpments. The surface rocks are Pennsylvanian and Permian, with the former beds ranging from the Fort Scott limestone, in western Craig County, upward to the top of

the Pennsylvanian system. The Permian beds extend from the basal Permian formations to the Herrington limestone member of the Marion formation. Although several limestones occur in this region, only the more important ones, with commercial possibilities, will be discussed.

Fort Scott limestone outcrops in a narrow belt from the Kansas line near Kinnison southwest to the Arkansas River, and covers an area of about 180 square miles. It consists of a lower limestone member 5 to 18 ft. thick, a middle shale member 7 to 8 ft. thick, and an upper limestone member 7 to 8 ft. thick. The limestone members are generally massive, hard, dense, nearly pure, which on weathering turn yellow or white. The character of the stone would permit its use for lime, cement, and crushed stone. Shale suitable for cement is associated with it.

Between the Fort Scott limestone and the Lenapah limestone are the Pawnee, Altamont, and Oolagah limestones, which are relatively impure and not fit for lime or cement, but could be quarried for crushed stone.

The Lenapah limestone outcrops in a narrow band in Nowata County, is composed of a single bed of dense, blue, fossiliferous, semi-crystalline limestone, and ranges from 9 to 30 ft. in thickness. Although analyses show that this stone is not desirable for lime or cement production, crushed stone has been produced from it. The Peerless Stone Co. of Coffeyville, Kan., is operating a quarry at Lenapah, Okla.

The Hogshooter limestone appears extensively south of Sand Springs, near Tulsa, where it reaches a thickness of 48 ft., and occupies an area of about 25 square miles. It is massive and fine-grained, and contains a high percentage of calcium carbonate and a relatively low silica content. A typical analysis shows the CaO content to be 49.11, the CO₂ content 44.00 and the S.O₃ content 0.45 percent. This limestone is tough and has a high crushing strength, and a commercial product is produced by the Seneca Stone Co., Chandler Materials Co. at a quarry at Garnett, and by the Standard Paving Co., at a quarry at Gray, near Tulsa. It is also suitable for lime and cement. A typical quarrying operation is that of the Standard Paving Co., which has a quarry and plant on the bank of the Arkansas River.

Outcropping in an irregular band, beginning at the Kansas line and passing east of Dewey and Bartlesville and extending southwest into Okfuskee County, the Dewey limestone covers an area of about 54 square miles. It is a bluish, semi-crystalline, shaly, often massive-bedded, fossiliferous limestone, and weathers to a cream or buff color. It



Gravity flow features the operation of the Standard Paving Co. crushed-stone plant at Gray. Vertical distance from primary crusher to finished material bins is 216 feet

begins at about 3 ft. thick near Wann, and increases to 20 ft. at Dewey, then thins again to the south. The Dewey Portland Cement Co. operates a plant just east of Dewey, where the limestone is weathered to a depth of about 4 ft., and is fresh and blue beneath the weathered zone.

The Ochelata formation consists of four members, of which the fourth, the Avant limestone, is the most important. It is about 200 ft. thick near the base of the formation and outcrops principally east of Avant, extending in a narrow band south to near Sapulpa. This formation covers about 10 square miles near Avant. It has been used for crushed stone by a railroad, quarried from a local pit near Avant. The stone is unsuitable, however, for lime or cement.

Another limestone suitable for crushed stone is that contained in the Pawhuska formation which outcrops in an irregular strip extending from the Kansas line southwest to a point near Ada. It has an average thickness of about 50 ft. and the limestones are generally light to dark gray, hard, semi-crystalline, and thin to massive bedded.

Stone from the Herington formation, which occurs as a sinuous band from the Kansas line passing east of Newkirk and Ponca County, has been quarried for agricultural limestone by several small plants, including the Brantingham quarry at Ponca City. This limestone consists of three beds of light gray limestone separated by shale beds. The upper beds are generally badly weathered, while the lower bed is massive and more resistant. The thickness reaches 20 ft. in some parts of Kay County, with the lower bed accounting for about half of the thickness.

Arbuckle Mountain Region

Outcropping in the region of the Arbuckle uplift are the limestones and dolomites of the Arbuckle Mountain area, which include about 800 square miles in southern Pontotoc, western Coal, northern Johnston, northeastern Carter, and eastern Murray Counties. The dome-like hills of the Arbuckle Mountains form a low plateau, gently inclined to the south, with the western part of the uplift reaching an elevation of about 1350 ft., and 400 ft. above the plains on either side. The formations exposed in the uplift include pre-Cambrian igneous rocks, folded sediments of the Cambrian, Ordovician, Silurian, Devonian, and Mississippian systems; horizontally-bedded Pennsylvanian and possibly Permian formations; and Cretaceous rocks that overlap the southern part of the uplift. The structure of the sediments is that of a broad anticline with many small anticlines and faulted synclines. Erosion has removed the rocks to the heart of the uplift, exposing the pre-Cambrian ig-



Quarry at Stringtown plant of Southwest Stone Co. Note almost vertical dip of stone

neous material and the entire section of sedimentary rocks.

The most important formation of the entire area is the Arbuckle limestone, which forms the main mass of the Arbuckle Mountain uplift, and attains a thickness of 8000 ft. It covers an area of about 350 square miles and consists of thin, medium, and massive bedded, gray, blue, and cream colored limestone with layers of shale, sandstone, and dolomite. It is tough, hard, and has great crushing strength and has been used extensively as crushed stone for concrete and road work. One of the larger quarries in this area is the one located at Crusher, near Dougherty, operated by the Dolese Bros., Oklahoma City.

The Simpson group outcrops from a point two miles east of Tatum nearly to Ravia, a distance of about 35 miles, and occupies a narrow strip from two-fifths to a mile in width. The group is divided into five formations with a thickness of well over 2000 ft. One of these formations, the Viola limestone, is quarried by Dolese Bros. at Bromide. Also located in this formation is the quarry of the Oklahoma Portland Cement Co. at Lawrence.

Chimneyhill, Bois d'Arc, and Sycamore limestones also occur in this region, but all are unsuitable for concrete aggregates, lime, or cement, as they are either scattered or would require considerable stripping before quarrying would be possible.

Wichita Mountain Region

Exposed on the surface in the Wichita Mountain uplift are the Arbuckle and Viola limestones in northwest Comanche, southwest Caddo, and eastern Kiowa Counties. The outcrop is in the form of low rounded hills which rise gradually from flat Permian sediments to heights of from 400 to 600 ft.

The Arbuckle limestone occupies an area of nearly 50 square miles, and occurs as a range of low hills beginning about seven miles north of Fort Sill and extending 21 miles northwest. It is a hard, semi-crystalline, thin-bedded stone, shaly and platy in part, and weathers with a yellowish-white surface. Thickness ranges up to 4000 ft. The individual beds are usually less than 5 ft. thick and vary from dense, fine-grained, white stone to cream colored dolomitic limestone interstratified with slightly argillaceous and siliceous lime beds.

A large crushed-stone plant is operated by the Dolese Bros. near Lawton, from this formation. The supply in the region is unlimited and the material is readily accessible. Parts of the area are suitable for cement and lime.

The Simpson Group and the Viola limestones, also occurring in this region, are not important commercially since their limited extent and impure nature do not fit them to be used as commercial stone.

Cretaceous Area

The Cretaceous limestone area is bounded by the Arbuckle and Ouachita Mountains on the north and by the Red River on the south. The area comprises the northern portion of what is known as the Gulf Coastal Plain, a region extending from the flanks of the Arbuckle-Ouachita Mountains to the Gulf of Mexico. Surface formations consist chiefly of Cretaceous limestones, shales, clays and sandstones.

The most important commercial limestone in this area is the Goodland, which outcrops as an escarpment in the form of a narrow band that extends east to west. It is about 25 ft. thick but has been known to attain a thickness of 50 ft. in some places. The outcrop covers an area of about 350 square miles. The Good-

land limestone is a massive, white, fossiliferous limestone, semi-crystalline, and grades from nearly pure calcium carbonate in the upper beds to a highly siliceous limestone in the lower beds. The outcrop is extensive and an immense supply of material is available. No stripping is necessary and drainage is of no consequence, since operations would extend to only a shallow depth. The upper part of the formation is remarkably pure and is an excellent source for lime. This limestone, together with the Kiamichi clay immediately overlaying it, furnishes an almost inexhaustible supply of the constituent materials for cement.

Wapanucka Area

The only important limestone in this area is the Wapanucka limestone, which outcrops as a prominent ridge in western Atoka County and passes as a sinuous band through parts of Johnston and Coal Counties to a point southeast of Franks in Pontotoc County. Mississippian and Pennsylvanian sediments cover the table where the Wapanucka limestone outcrops. It is brought to the surface in the western outcrop by the Arbuckle Mountains uplift. Stone is quarried at two plants in the Limestone Ridge outcrop, which consists of several ridges in northern Atoka County and in Pittsburgh County.

At Hartshorne, in Pittsburgh County, the Doiese Bros. are operating a crushed stone plant for the production of concrete aggregate and railroad ballast. At Stringtown, one of the largest plants in the State is operated by the Southwest Stone Co., Dallas, Tex. The stone in this area is tipped to almost 90 degrees, and blasting has been made easier by this geological structure.



Snake-holing into face of rock at Stringtown plant, Southwest Stone Co. When holes are shot, the entire face above is brought down

State Highway Construction Material Specifications

OKLAHOMA is blessed with some highway construction materials that most other States do not have, such as rock asphalt and caliche. The native rock asphalts are both impregnated limestone and impregnated sandstone and sand. Caliche is a conglomerate of sand and gravel bonded, usually with calcium carbonate. It is easily broken up but re-bonds when wet and compressed, forming an excellent foundation material in dry climates.

Being primarily a petroleum-rich State, there are naturally many more miles of asphalt type State highways than portland cement concrete pavements. However, as in previous articles in this series, we are primarily interested in specifications for portland cement concrete in order that these may be compared with those of other state highway departments. These Oklahoma specifications date back to 1937 and apparently no significant changes are contemplated in the near future.

Cement

The specifications for portland cement are the usual ones: A.S.T.M. for normal portland cement and for high early strength portland cement. Each carload must be tested in accordance with the methods prescribed by the American Association of State Highway Officials, unless taken from tested bins. "Different brands or grades of cement must be stored and used separately."

Fine Aggregate

The specifications for fine aggregate for portland cement concrete and mortar differ somewhat for Grade A and AA concrete and Classes B and C concrete. Grade A is for concrete pavements and base courses. Class AA is concrete for slabs and girders without wearing surface, for concrete piles, handrails and bridge floors. Class B concrete is used in mass abutments, wing walls, piers, etc. Class C is a lower grade of concrete to be used only as shown on the plans.

Although more leeway is allowed in the fine aggregate grading in the B than in the A concretes, the principal difference is in the cement contents. Class AA concrete has a minimum of 7 sacks of cement per cu. yd., Class A concrete 6 sacks, B concrete 5 sacks and C concrete 4.2 sacks. The specifications for Class B concrete permit, but apparently do not require, more finer sizes than Class A or AA.

There are the usual limits on deleterious substances as follows:

Removed by
decantation 3 percent by wt.
Shale 1 percent by wt.
Coal or lignite . . . 1 percent by wt.

Cinders and
clinkers 0.5 percent by wt.

The sum of all the deleterious materials must not exceed 5 percent.

Fine aggregates in Grade A (see screen analysis below) must meet a 1:3 mortar tensile strength test at 7 and 28 days equal to that with standard Ottawa sand. Grade B fine aggregate and sand for masonry mortar need have 1:3 mortar tensile strength of only 85 percent of those with standard Ottawa sand.

SIEVE ANALYSIS—GRADE A

Passing No. 4 . . . 95 to 100 percent
Passing No. 20 . . 50 to 75 percent
Passing No. 50 . . 5 to 25 percent
Passing No. 100. 0 to 5 percent

SIEVE ANALYSIS—GRADE B

Passing $\frac{3}{8}$ -in. . . . 100 percent
Passing No. 4 . . . 90 to 100 percent
Passing No. 20 . . 50 to 85 percent
Passing No. 50 . . 5 to 35 percent
Passing No. 100. 0 to 10 percent

SIEVE ANALYSIS—MORTAR SAND

Passing No. 8 . . . 100 percent
Passing No. 50 . . 15 to 40 percent
Passing No. 100. 0 to 10 percent

These are not the usual sieve sizes and consequently in order to make our chart comparable with those previously used in this series, we have interpolated the 20-mesh on a logarithmic scale between the usual Nos. 16 and 30. If the average of the 81 sieve analyses plotted on the same chart represent typical Oklahoma concrete sands, it is obvious they can be processed to be very well graded.

Chat Sand

Chat, the by-product of zinc and lead mines, may be used as fine aggregate for concrete pavement, in which case the following are the gradation requirements:

Passing $\frac{3}{8}$ -in. . . 95 to 100 percent
Passing No. 4 . . . 70 to 90 percent
Passing No. 20 . . 25 to 60 percent
Passing No. 50 . . 5 to 30 percent
Passing No. 100. 5 to 15 percent
Wash loss 0 to 10 percent

Coarse Aggregate

Coarse aggregates for portland cement concrete may be crushed stone, gravel or chats. The maximum percentages of deleterious substances are limited by weight as follows:

Removed by
decantation 1.25 percent
Shale 0.50 percent
Coal or lignite . . . 0.50 percent
Soft fragments . . . 5.00 percent
Cinders and clinkers. 0.50 percent

The sum of the above deleterious substances must not exceed 5 percent.

OPERATING TRENDS

The loss in the A.A.S.H.O. T-3 and T-4 wear test must show losses not exceeding 7 percent for crushed stone and 15 percent for gravel.

Gradation requirements for base courses are as follows:

Passing 1½-in.	100 percent
Passing ¾-in.	75 to 100 percent
Passing ½-in.	65 to 90 percent
Passing ¾-in.	60 to 85 percent
Passing No. 4.	45 to 75 percent
Passing No. 10.	35 to 60 percent
Passing No. 40.	25 to 45 percent
Smaller than	
0.05 mm.	10 to 25 percent

For aggregate in concrete pavement or concrete base course:

Passing 2½-in.	100 percent
Passing 2-in.	95 to 100 percent
Passing 1½-in.	70 to 95 percent
Passing 1-in.	50 to 85 percent
Passing ½-in.	15 to 40 percent
Passing No. 4.	0 to 5 percent

For aggregate in Classes A and AA concrete:

Passing 1½-in.	100 percent
Passing 1-in.	90 to 100 percent
Passing ½-in.	25 to 60 percent
Passing No. 4.	0 to 5 percent

For aggregate Classes B and C and massive Class A concrete:

Passing 2-in.	100 percent
Passing 1-in.	40 to 75 percent
Passing No. 4.	0 to 5 percent

Bituminous Pavements

For single bituminous surface treatment (Class A) natural gravel, crushed gravel, mine chats, broken stone, or



Crushing and screening plant of Southwest Stone Co., Stringtown. Primary crusher at left

any combination of these materials may be used:

Passing ½-in.	100 percent
Passing ¾-in.	5 to 100 percent
Passing No. 10.	0 to 10 percent

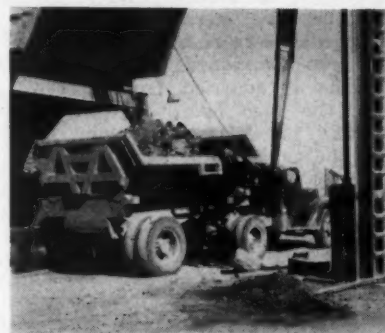
For double bituminous surface treatment the aggregates must be crushed: "When gravel is used at least 90 percent of the particles retained on No. 4 sieve must have one or more fractured faces. Such fractured faces may be natural or obtained by mechanical means."

Gradation for No. 1 cover material:

Passing 1-in.	100 percent
Passing ½-in.	0 to 20 percent
Passing No. 4.	0 to 3 percent

Gradation for No. 2 cover material:

Passing ¾-in.	100 percent
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Truck haulage from quarry-to-plant at the Southwest Stone Co., Stringtown

Passing ¼-in.	20 to 60 percent
Passing No. 10.	0 to 10 percent
Passing No. 100.	0 to 2 percent

Subgrade Treatment

Oklahoma state highway engineers lean toward the stabilized subgrade rather than the "ballasted" subgrade. The following paragraph covers this material: "The selected materials for completion of subgrade to the thickness shown on the plans may be a sandy-loam soil of the A-4 group or better, sand or coarse aggregate, pit gravel or a combination of these. The materials placed shall be well graded in order to provide stability for paving operations and in no event shall the Plasticity Index of the minus 40-mesh material exceed 8." The "A-4" and "Plasticity Index" refer to standards established by the U. S. Bureau of Public Roads for subsoil grading.

Rebuild Plant

ARTHUR SMITH LUMBER CO., Browns-ville, Tenn., has rebuilt its plant which was destroyed by fire about one year ago. Concrete sewer pipe and other concrete products are handled. Arthur Smith, owner, has just returned from several months' service in the armed forces.

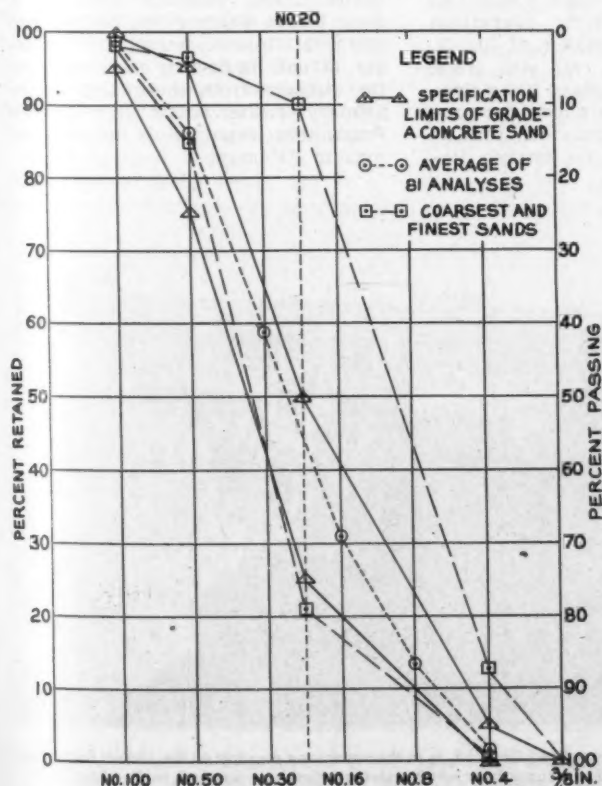


Chart showing average analysis of 81 different sands compared with specifications for concrete sand

Typical Aggregates Operations

CEMENT PRODUCTION in the state of Oklahoma is confined to two plants, one at Dewey operated by the Dewey Portland Cement Co., and one at Ada, operated by the Oklahoma Portland Cement Co. The quarries of the Oklahoma Portland Cement Co., located at nearby Lawrence, have been in active operation since 1907. The rock quarried is the Fernvale limestone of Ordovician age, which is non-cherty and contains no visible impurities except pyrite, which occurs sparingly along joints and fault surfaces. The Fernvale limestone is superior to the Viola limestone, which underlies the Fernvale, previously quarried by the company but which has been abandoned.

Stone is quarried from a 60-ft. face, the face being developed by working the nearby flat-lying beds into the gentle slope of a large hill. There is no overburden. Holes are drilled 6-in. uniform, spaced 15-ft. centers, and loaded with 60 percent gelatin. About 100 holes are shot at once, yielding about 100,000 tons of stone. Stone is loaded by Marion steam and electric shovels into electrically-powered 12½-ton dump cars which take it to the crushing plant.

At the plant, stone is crushed to a minus 6-in. size by a 36- x 72-in. jaw crusher. Crusher throughs are sent to two Williams hammermills which reduce it to minus ¾-in. The stone is then sent by rail to the cement plant at Ada. Present production is about 1000 tons per day.

About ¼-mile distant from the limestone quarry is a shale quarry, where the shale is taken directly from the face by a 2½-cu. yd. Marion steam shovel and loaded for shipment to the cement mill without further processing. About 10 cars per day are shipped.

In addition to the production of cement, waste flue gases are captured and are converted into dry ice at a plant adjoining the cement mills.

At Dewey, the Dewey Portland Cement Co. quarries a limestone known as the Dewey limestone, which contains enough shale in the raw state to eliminate the use of additional shale, and is classed as a natural cement resource. Stone is quarried to a depth of about 15-ft. and is taken by rail to the plant. Articles on this operation have appeared in previous issues of *Rock Products*.

Crushed Stone

Several large crushed-stone operations are producing to full capacity in Oklahoma. Located in the south central section are several quarries operated by the Dolese Bros., who have plants at Bromide, Dougherty,

Lawton, Hartshorne, and Big Canyon. The operation at Dougherty is located in the Washita River gorge, and produces stone for highway construction, railroad ballast, and local uses. The quarry face is about 100-ft. high and extends well over 800-ft. This plant is served by the Santa Fe railroad.

Viola limestone of the Simpson group is quarried at another Dolese Bros. plant, located at Bromide. The quarry is about 500-ft. long with a 50-ft. face and also produces road stone and ballast.

One of the larger Dolese Bros. operations is that at Lawton, which is in the Wichita Mountain Region. Served by the Rock Island Railroad, this plant produces railroad ballast and concrete aggregate. The face of the 500-ft. quarry is about 100 ft. high, and the stone quarried is tough and durable, as is the other stone in this region, and makes an excellent road material as well as concrete aggregate.

The plant of the Standard Paving Co., at Gray, features gravity flow from primary crusher to the finished product bins. The plant is located on the side of a hill near the Arkansas River. Stone is taken from the quarry by dump trucks which put material into the primary crusher located at the top of the hill. Gravity flow carries the stone through a series of crushing and screening operations down the bank a distance of 216-ft. to the bins, where rail and truck loading is done. The plant has a flexible operation, which allows for production of road and concrete stone as well as agstone, as the market dic-

tates. During the war years, when construction work on highways was more or less at a standstill, about 90 percent of production was agricultural limestone, but facilities are such that a rapid changeover can be made when the need arises for construction stone. A complete story on this plant appeared in the August, 1945 issue of *Rock Products* on page 90.

Located in the Boone Formation, the St. Clair Lime Co. is quarrying stone from the excellent St. Clair limestone area. Starting with two vertical gas-burning kilns, production of lime was about 60 tons per day. Soon a new kiln was added which increased production another 75 tons per day and the Azbe "center burner" system was installed in the old kilns which increased production to a total of 175 tons per day. At present, plans are under way to further increase production by new additions.

In the Wapanucka Area, at Stringtown, is one of the largest crushed stone plants in Oklahoma, that owned and operated by the Southwest Stone Co., of Dallas, Tex. The unusual formation, which occurs as the result of faulting, dips almost 90 deg. which enables the company to blast using snake holes. These holes are drilled horizontally at the bottom of the face, and when shot, the entire face comes down. Primary crushing is done before delivery to the enclosed plant for final screening and crushing. Truck haulage is employed, and the distance from the quarry to the primary crusher is less than ¼-mile. Production capacity is about 5000 tons in 24 hours.



Pit of the Mid-Continent Glass Sand Co., Roff, is in the sandstone member of the McElsh formation. Monitors wash sand to a sump from which a steam pulsometer pumps it to the plant

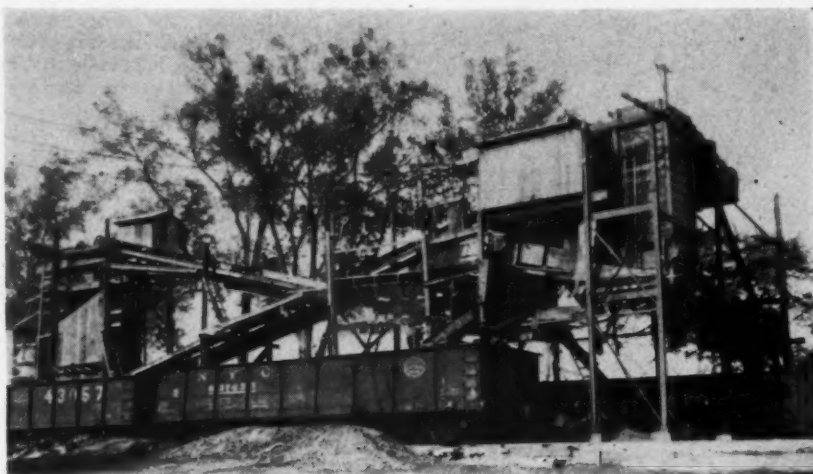
Sand and Gravel

Typical of the many sand plants on the Arkansas River is that of the Tulsa Sand Co., Tulsa, where sand is pumped from the river by a dredge and sent to screens for sizing. The sand thus recovered meets Federal specifications with but two exceptions. There is an absence of 100-mesh material and an over-abundance of material between the 30- and 50-mesh sizes. The latter difficulty is remedied by collecting this size and wasting it, so that the required amount is in the finished product. The absence of 100-mesh is due entirely to the absence of it in the river, and when Federal specifications are to be met, some method of blending must be employed. The sand does meet the State specifications, however. To meet the more rigid Federal specifications, one producer has suggested that fine sand be recovered from wind-blown deposits and bagged. Thus it could be added at the mixer much in the same manner as cement, which would permit the use of the sand with no 100-mesh material. There are numerous smaller operations in the Tulsa area, all reclaiming sand from the river. Some of the typical ones are the Tulsa Sand Co., Bagby-Harris Sand Co., Smith Sand Co., Doyle Sand and Materials, and Glenn Sand Co.

Several sand recovery plants are operated by Dolese Bros., and the one at Oklahoma City is typical of the other operations. At this plant, sand is pumped from a 75 acre area by an Amsco pump which sends it at about 10-percent solids to a gravity scalping screen located at the top of the plant. The ledge available for reclamation is about 12 to 15 ft. deep with negligible overburden. Material is pumped over a 4- x 12-ft. single deck scalping screen set at a 45-deg. angle, with 1/4-in. openings.



Plant of the Mid-Continent Glass Sand Co. at Roff. Sand is beneficiated on concentrating tables and flotation cells. The final product is suitable for high-grade glass manufacture



Gravel plant of Muskogee Materials Co. at Fort Gibson. Gravel is screened and crushed and loaded to cars on either side of plant for shipment

Here trash, shale, clay, grass, and other foreign particles are removed, and laundered to waste. To assist in the movement of the solid particles through the flume, a 1-in. pipe has been tapped into the 6-in. pipe from the pit, which sends water to the flume thus moving the waste particles along the flume. About 35 percent of the total pumped to the screen is waste.

Passing the scalping screen, the sand is laundered to a three-compartment settling tank, 9-ft. long, 4-ft. wide, and 7-ft. deep, which has two movable partitions to form the three compartments. Fine sand is collected in the last compartment, coarse sand in the first, and a medium grade in the middle compartment. The position of the partitions governs the relative fineness of the sand collected, that is, if the partition between the first and second tank is kept higher up, more fines are collected in the first tank, and vice versa. If the partitions are maintain-

ed at a lower level, the coarser sand will settle in the farther compartments more so than if the partitions are maintained at a higher level. Overflow from this tank is laundered to waste. Each compartment has a cone valve in the bottom which is manually operated. Each compartment also has a glass pane inserted into the side so that the operator can determine the level of the sand in the tank. Levers operate the discharge and the operator adjusts the discharge so that the proper amount of coarse and fine sand is sent from the tank to screws below.

Flow from the tank goes by gravity to two 20-in. dewatering screws which discharge to a flume for movement to a sump outside the plant. Two water pipes carry clear water which is also sent to the sump to wash the sand again. Washing is also done at the screws, with three pipes sending water into the screws and two to the finished pile in the sump at about 150 g.p.m. The sand is picked up from the sump by a clam-shell crane and put into stockpiles or bins. Capacity is about 40 tons per hour.

Just above the junction of the Grand and Arkansas Rivers is located the plant of the Yahola Gravel Co., on the Grand River. Gravel is pumped from an alluvial deposit in the river, which contains practically no fines. The material is pumped by a 10-in. pump to a sump, where mud is washed away. From the sump, the material is reclaimed by a crescent scraper and sent to a belt conveyor for movement to the washing, screening, and crushing plant. The gravel is screened by a triple-deck Diamond vibrating screen, with oversize going to a Tel-smith crusher. Crusher throughs return to the screen by belt conveyor. Gravel passing the three decks is the finished product, with the exception that the fines, passing No. 6-mesh, are wasted when desired. The demand for this size is so small

OPERATING TRENDS



Trucks, loaded by crane from alluvial deposit in Rock Creek, take material about one mile to screening plant of Makins Sand and Gravel Co.

that very little of it is saved. This plant is located on a railroad spur which allows car loading directly from screens. Capacity is about 20 cars per day.

Three plants are operated by the Muskogee Materials Co., known as the Fort Gibson plant, the Katy plant, and the K. O. & G. plant. The former is a gravel plant and the latter two are sand plants. All three are above the junction of the Grand and Arkansas Rivers, the gravel plant being on the Grand and the sand plants on the Arkansas.

The Fort Gibson plant was built in 1941 and will continue to operate from the river until the deposit is depleted, which will be in about seven years. The reason that depletion will occur is that a new dam is being built just above the plant which will halt the deposit of material, which would otherwise allow the plant to remain and produce indefinitely.

At present, a bar well out in the river is being exploited. This necessitates a long haul to the plant, so that two dredges are used. The first dredge, with a 10-in. Amsco pump moves material a distance of 650-ft. where it is picked up by the second dredge. This dredge also has a 10-in. Amsco pump, and pumps 700-ft. to the plant, with a 60-ft. lift. About 10- to 15-percent solids pass through the pipes. The line to the plant discharges over a triple-deck Tel-smith 6- x 12-ft. vibrating screen, with 1½-, ¾-, and ¼-in. sq. openings on the three decks respectively. Oversize goes by 24-in. belt conveyor to a 20-cu. yd. hopper with a split discharge for feed to two 36-in. Tel-smith cone crushers. About 10-percent of the product has to be crushed. Crusher throughs are returned to the screen by another 24-in. belt conveyor. Ma-

terial retained on the other decks drops to cars as finished material. The plant is located between two spur tracks so that cars may be loaded on both sides.

Material passing the lower deck goes to waste through a flume, except in rare instances, when fines are to be reclaimed. When such a condition exists, fines are caught in a cone under the flume. The material caught in the cone has about 20-percent passing 10-mesh. This plant has a capacity of about 1,000 tons per day, and approximately 20,000 cars have been loaded since 1941.

The material below 10-mesh is rarely used because the sand contains too much flint and is too coarse.

Located on the Arkansas River, the Katy or Wybark plant produces sand only, in three sizes which can be blended into railroad cars to desired specifications. Sand is pumped from the river by an 8-in. Amsco pump powered by a 219-hp. Buda motor which uses natural gas. Sand is pumped through 400-ft. of pipe, at



Katy plant of Muskogee Materials Co. which recovers sand only. Sand is collected in three boxes. Amount of discharge from each box gives correct blend of sand sent into cars

about 10- to 15-percent solids to the plant. Here it discharges over a 5- x 6-ft. gravity screen set at a 45-deg. angle, with ¾-in. sq. openings. Trash, sticks, flat sand stone, and other foreign particles are scalped off at this screen and sent to waste through a flume. Sand passing the scalping screen drops to a 4- x 5-ft. gravity screen with 3/16-in. sq. openings, also set at a 45-deg. angle. Below this screen are three tanks for the collection of the three grades of sand. Sand retained on the second screen goes into the first tank, and throughs go to the second tank with the overflow passing to the third tank. The tanks are square at the top and taper in a cone shape to a discharge gate at the bottom. They are 5-ft. square at the top and about 5-ft. high, and are located directly above the spur track so that the sand can be sent by gravity to cars for shipment. Different specifications can be met by drawing off the desired amount from each of the three tanks. Sand collected in the first tank does not contain much below a 20-mesh, the second tank has a product which contains

about 25 percent passing the 50-mesh, and the third tank contains practically all fines, with about 90 percent of the sand below 50-mesh.

The capacity of this plant is about 140 tons per hour and much of the business is with the government and state highway. Engine sand and blast sand is also sold.

The smallest of the three operations is the K. O. & G. plant which is a sand plant only. It is also a dredging operation, with material being sent to two wooden boxes under screens. Fines are sent to waste and the sand collected in the boxes is sent through a flume to a common pit or sump where it is picked up by a clamshell and loaded to trucks or to bins, or stockpiles. The dredge can also pump to another setup a little farther removed from the river, where it is screened and sent to three boxes above a spur track for railroad car loading. This plant is similar to the Katy plant and is about half as large.

Material reclaimed from an alluvial deposit on Rock Creek in the Arbuckle Mountain region is processed at the Makins Sand and Gravel plant near Dougherty, Okla., and blending equipment insures the production of any specification desired.

The material is taken from the river deposit by a Link-Belt Speeder crane with a 1¼-cu. yd. bucket, which loads ten trucks for delivery to the plant about one mile distant. Here the trucks drive up a ramp and discharge over a rail-type grizzly above a reinforced concrete sump pit. The material passing through the grizzly drops over a stationary inclined screen with 3-in. openings, and oversize goes to a 15- x 36-in. Diamond jaw crusher. Material passing the screen and crusher throughs drop into the 15-ft. sq. sump pit where an 8-in. Amsco pump sends it up to the plant at about 75-percent solids.

(Continued on page 106)



Plant of the Makins Sand and Gravel Co. near Dougherty. Fines passing screen are transported in pipes, foreground, to sump where it is picked up and stockpiled by clamshell

J&L PERMASET PRECISIONBILT PRE-FORMED WIRE ROPE



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Avoids Brittle Weld Deposits

and brings you
improved welding
qualities

Manufacturing manganese electrodes by usual methods presents complications. Too little manganese may cause brittleness of deposits... too much makes drawing impossible. **STOODY** neatly solves the problem with an improved method of manufacture. Alloying elements are tightly rolled in mild steel tubes. Percentage of manganese can thus be raised to allow for burn-out loss with an ample margin of safety to assure maximum toughness and wear resistance in welded deposits. Drawing limitations are thus completely sidestepped!

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For maximum life and wear resistance hard-face all built up parts with **STOODY SELF-HARDENING**. Literature on request.

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STOODY HARD-FACING ALLOYS

Retard Wear Save Repair

Oklahoma Sand

(Continued from page 104)

The pipe from the sump discharges over a gravity screen with 3/16-in. openings, which removes the sand and sends it into a sand box. Oversize goes to a triple-deck 4- x 8-ft. Tel-smith vibrating screen, where oversize is scalped off and sent to a 9- x 36-in. Diamond jaw crusher, and the other products from the three decks go to bins as sized gravel. Product from the jaw crusher returns to the sump for recirculation through the plant. Sand taken out at the first screen goes to the sand box from where it is sent to a bin for truck loading. A single screw takes the sand from the box to the bin. Overflow water from the screw returns to the sump through a 10-in. pipe which serves to wash the material from the primary crusher into the pit. Water for washing is supplied

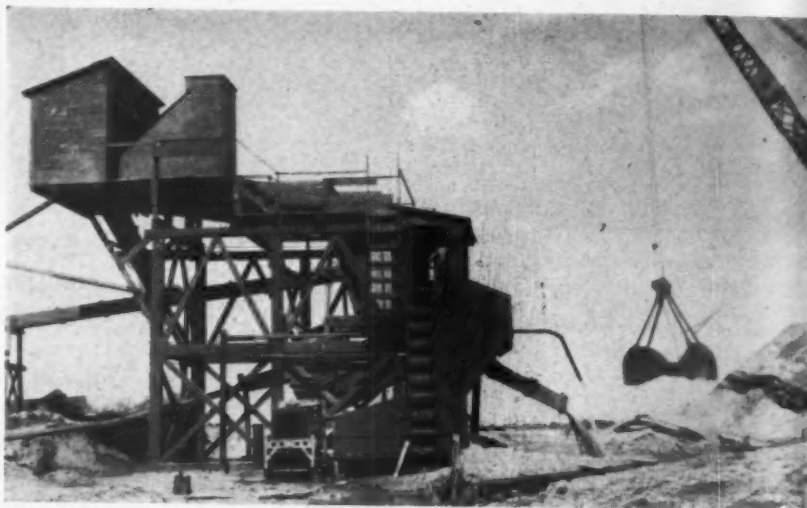
by a 5-in. Gould pump, located at the nearby creek. The sand passing the lower deck of the triple-deck screen is sent through a pipe to a sump adjacent to the sand bin, where it is picked up by a clamshell crane and stockpiled. The gravel bins, three at 60-tons capacity each, discharge to a 24-in. blending belt conveyor which moves any size material to a separate steel bin, with a capacity of 40 tons. This bin loads either trucks or railroad cars.

The plant produces about 50 cars per day, with about 70-percent gravel and the balance sand.

Glass Sand

Located in the south central part of the state, near Ada, is an area particularly suitable for the production of glass sand. There are now four plants located within a few miles of one another producing high

(Continued on page 108)



Sand plant of Dolese Bros. at Oklahoma City. Sand is pumped to gravity screen where trash is scalped off. Sand is then recovered in settling tanks and dewatered before laundering to sump where it is picked up by clamshell



Blending belt under bins allows production of any specification at the sand and gravel plant of Makin's Sand and Gravel Co. near Dougherty



Republic Rubber Hose

IMPROVEMENTS AID ROCK PRODUCT INDUSTRIES

CUTTING, abrasive action of sharp rock, heated oil from compressor, high pressures, exposure to the elements—these are some of the operating conditions which make maintenance of rubber hose a problem in rock product industries. The conditions can't be changed, so Republic, long ago, designed hose especially equipped for extended service under the severest of such abuse. Republic brand names such as Champion and Tower Air Hose, Tonka Water Hose, Republic Jet Hose and others became well known for their aid to equipment maintenance. Now, through Republic's application of technological advances, hose maintenance is an even lesser problem. Call your nearby Republic Distributor on your next requirements.

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Approved protection against all dusts. Large twin filters provide low breathing resistance. Simple and rugged design. Flexible facepiece fits all faces without adjustment.



**M-S-A *Dustfoe*
RESPIRATOR**

Approved U. S. Bureau of Mines

One of the most compact and lightweight approved dust respirators. No interference with vision or the wearing of goggles. All parts easily removed for cleaning or replacement.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH 8, PA.

grade silica sand suitable for glass manufacture. The pioneer in the field is the Mid-Continent Glass Sand Co. at Roff, which has been producing since 1913. The deposit is in the sandstone member of the McLish formation of the Simpson group which is about 165-ft. thick in this locality. The sand crops out in flat plains and quarrying is done by sinking open pits into the sand after first removing the overburden of sandy soil and clay. Sand is broken down from the quarry face by monitors and pumped by steam pulsometer to the main plant for beneficiation. The sand in this particular deposit contains impurities of pyrite and limonite necessitating considerable beneficiating equipment. As the sand enters the plant, it passes over a vibrating scalper screen then into wash tanks. From the tanks it is sent to a battery of 12 Buchart concentrating tables where heavy impurities are removed. The tabled sand is then run through an 8-cell Denver flotation unit that floats and rejects pyrite not removed by the tables. The sand is dewatered and taken to storage where it drains for 36 to 48 hours. At the end of this period, it contains about 5-percent moisture and can be sold in this condition or sent into a rotary kiln for drying. Capacity is about 300 tons per 10-hour day. This plant has the distinction of being the only glass sand plant in the United States using flotation for removal of impurities. A complete story on this operation appeared in the March 1945 issue of *Rock Products*, page 58.

The newest glass sand plant in Oklahoma is at Hickory, operated by the Oklahoma Silica-Sand Co., which began operations in Oct. 1945. The deposit is in the sandstone member of the Oil Creek formation of the Simpson group. In the vicinity of Hickory, the sand member is 230-ft. thick. The crude sand is loosely cemented and contains a small amount of limonite impurity as coatings on the grains as well as individual aggregates. Overburden is about 10-ft. thick, and after removal, the sand is broken up by a hydraulic monitor which washes it into a sump. It is lifted from the sump by a centrifugal

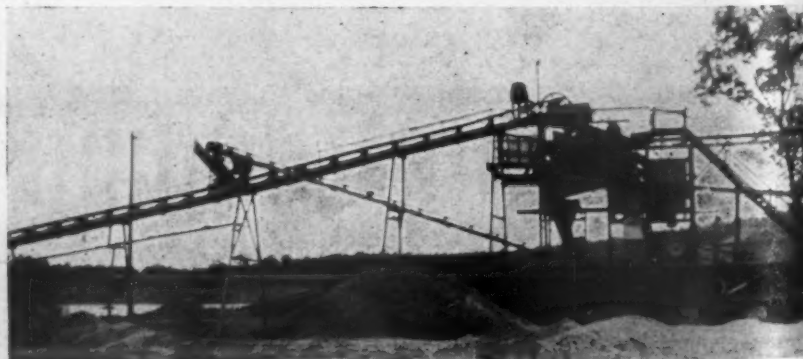
pump to the washing plant where it goes into a surge box before introduction to screens. From the screens it enters dewatering units and log washers before being sent to wet storage. The sand is dried in a rotary drier and then stored in bins. Production capacity is about 50 tons per hour.

The Sulphur Silica Co. at Sulphur works a deposit in the sandstone member of the Oil Creek formation which is about 400-ft. thick. The sand is light-colored, fine-grained, and rather soft, and is worked by hydraulicking from an open pit. From the pit, the sand is pumped by steam pulsometer to concrete wash boxes, after first passing a vibrating scalper screen. Washed sand is taken by a clamshell crane from the wash boxes and placed in open piles for wet storage, and is then trucked to the drying and shipping plant some 3½ miles distant. Sand is dried in a rotary kiln before shipment. Production at this deposit was started in 1939 and present capacity is about 150 tons per 8-hour day.

The quarry of the Mill Creek Sand Co., a subsidiary of the Hazel-Atlas Glass Co., has been in operation since 1918. The quarry is in the sandstone member of the Oil Creek formation and is about 360-ft. thick. It is composed of nearly white, fine-grained, silica grains. Although the formation is moderately soft, it is shot at times to loosen the face, which is about 67-ft. high. After shooting, the sand is washed to a sump and lifted by steam pulsometer 85-ft. vertically to the washing plant, where it passes a scalper screen and is washed in concrete boxes. It is then dewatered and taken to wet storage by belt conveyor. The sand is drained and shipped without drying to the Hazel-Atlas glass plants at Ada and Blackwell.

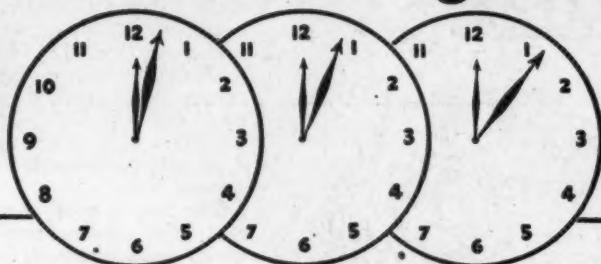
The finished sand at all plants has an SiO_2 content of better than 99.8 percent, and an Fe_2O_3 content of less than 0.045 percent.

Asphaltic sandstone in the sandstone member of the Oil Creek formation at the quarry of the Southern Rock Asphalt Co., near Daugherty, has been worked since 1890.



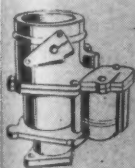
Screening and crushing plant of Yahola Gravel Co., Fort Gibson. Sized gravel is loaded directly to cars for shipment

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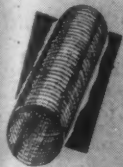
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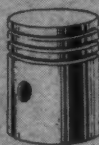
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and diesel engine
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Also effective for
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LOADING RIPRAP
QUARRY WORK
ROAD BUILDING
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in Quarry.

For new speed and efficiency in moving materials on hand loading jobs, mount a Load Lugger on your standard truck chassis.

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Write for Bulletin

**BROOKS EQUIPMENT
AND MFG. CO.**

402 Davenport Road, Knoxville 8, Tenn.
Distributors in All Principal Cities

Making Quality Lime

(Continued from page 91)

and all heat below 1500 deg. F. in the gases would go to waste; excess air would further waste heat from the high intensity stream and there would be radiation as well and a rather considerable amount.

This seems overdrawn, but it is not. Some kilns operate precisely that way, and many are very close to it. To prove this their fuel-lime ratio need only be compared with that developed here.

The fuel is good high grade B.t.u. coal, but percentages here given would apply to coal of any heat value and, roughly, also to oil.

Heat in coal can be divided into three portions:

"Unavailable" which represents latent heat of water vapor; "High Intensity" about 1500 deg. F. and over and "Low Intensity" below 1500 deg. F.

HEAT DISTRIBUTION FROM ONE POUND OF COAL

	B.t.u.	%
"Unavailable" due to latent heat of H ₂ O.....	730	5.14
"Low Intensity" below calcination temperature ..	4580	32.74
"High Intensity" above calcination temperature	8690	62.12

14000 B.t.u. 100%
In any kiln the 5.14 percentage portion would be lost. In such a kiln as we are now contemplating, the 32.74 percentage would all go to waste and, in addition, the following amount of the 62.12 percentage portion.

"HIGH INTENSITY" HEAT DISTRIBUTION

Total available 8690 B.t.u. = 62.12%	B.t.u.	%
Excess air loss (20 percent excess air)	847	6.03

Radiation loss (15 percent of total heat).....	2100	15.00
Total of high intensity heat lost	2947	21.03
Total of high intensity heat remaining	5743	41.00

Next we determine the amount of heat necessary to preheat and calcine one pound of lime. Under these conditions all such heat will be derived from the "High Intensity" portion and, dividing the heat available (5743 B.t.u.) by the heat required per pound, gives the obtainable fuel ratio.

HEAT NECESSARY FOR CALCINATION AND PREHEATING FOR ONE POUND OF LIME

Preheating of CO ₂ portion of limestone to 1500 deg. F. ...	390 B.t.u.
Preheating of CaO portion of limestone to 2400 deg. F. ...	620 B.t.u.
Heat of calcination reaction to CaO at 1500 deg. F.	1220 B.t.u.
Total heat of preheating and calcination	2230 B.t.u.
Lime-fuel ratio or $\frac{5743 \text{ B.t.u.}}{2230 \text{ B.t.u.}}$ =	2.57:1

This ratio of 2.57:1, or 72 gal. of oil per ton of lime, may be considered tops in poor performance and many kilns come very close to it. A ratio of 3: 1, or an oil consumption of 63 gal. are common.

The reason their lime-fuel ratio is 3 to 1 rather than 2.57 to 1 is because lime is not 100 percent CaO, so actually a bit less heat is necessary than was assumed; also because some of the heat in the lime may be recovered, and some of "low elevation" utilized for stone preheating, as well as radiated from the kiln shell in place of the heat of "high elevation."

Now that the "low standard" was established and the reason discussed,

(Continued on page 112)

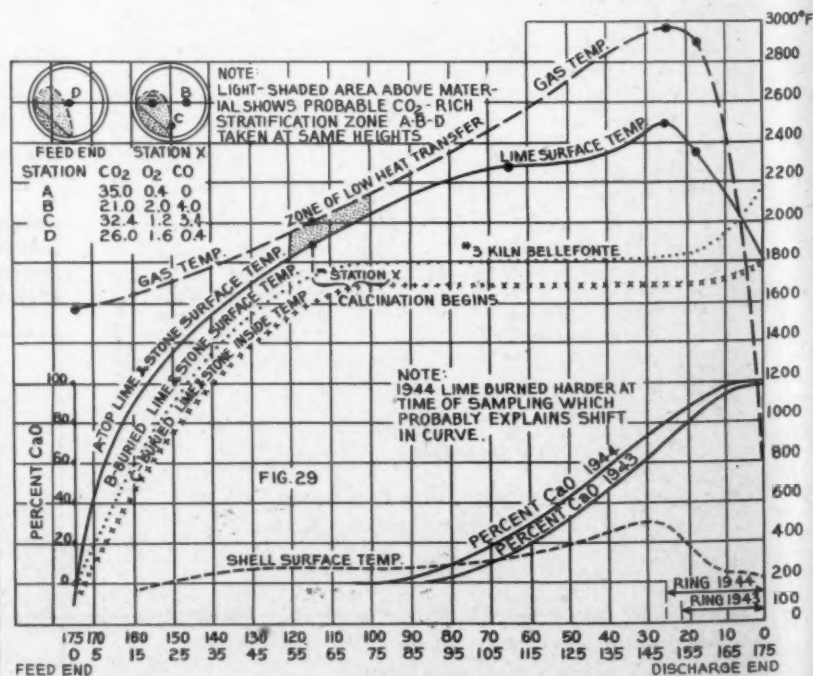


Fig. 29: Curves of combustion conditions in rotary kiln at Bellefonte, Penn., plant, The Warner Co.

There IS a Reason

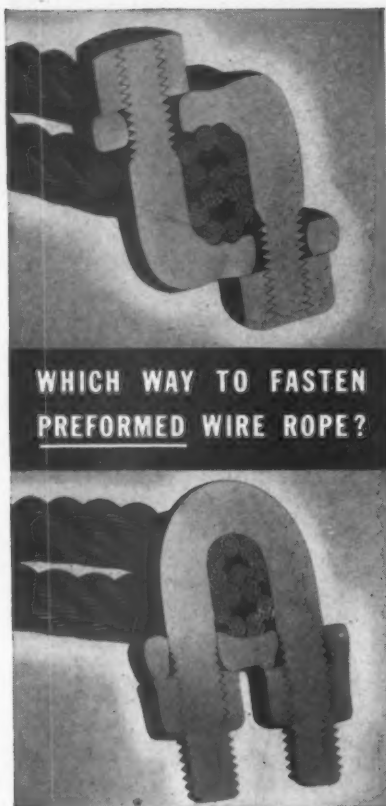
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WHICH WAY TO FASTEN PREFORMED WIRE ROPE?

The cross-section views show what happens to wire rope. In Fig. 1, Laughlin's "Fist-Grip" Safety Clip holds the $\frac{3}{8}$ " rope with hardly any distortion (note hemp centers). In Fig. 2, hemp center under U shows how rope is squeezed and flattened by U-bolt's smaller bearing area and "Finger-Pinch". Both were tightened to same tension by torque-indicating wrench.



Here's Why "Fist-Grip" Clips Work Better

Laughlin Safety Clips have identical saddles, flat sides; hold rope firmly without crushing. Saddles fit snugly against "live" and "dead" ends. Fewer clips deliver full rope power. The only clips with drop-forged bolts. Test them, for your rope's sake.

Distributed through mill, mine and oil field supply houses. Write for catalog. Dept. 4, The Thomas Laughlin Co., Portland 6, Maine.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS



Quality Lime

(Continued from page 110)

we will develop the "high standard" also. We will assume the same heat division between high and low intensity portions, also the same loss due to water vapor, excess air, and radiation. We will merely manipulate heat requirements for lime making in accordance with the prevailing conditions, considering full cooling of lime for one, and that plus full preheating of stone with low intensity heat for the other.

High Efficiency Operation

We will assume first that the kiln gas temperature would still be 1500 deg. F., but that the kiln was equipped with an efficient lime cooler, fully recovering sensible heat of the lime and returning all of it to the kiln. Heat necessary for calcination and preheating per pound of lime would then be:

Calcination reaction at 1500 deg. F.	1220 B.t.u.
Preheating of CaO portion of lime (all returned by cooler)	
Preheating of CO ₂ portion of limestone	390 B.t.u.

Total heat abstracted from high elevation heat stream. 1610 B.t.u.

As all sensible heat of the lime is returned to the kiln, none can be charged for, but since all of it came from the high intensity portion, there is no credit. Fuel ratio is increased but not to the extent possible when stone is preheated with waste heat.

We will suppose next that all of the stone preheating is with heat of low elevation and all sensible heat in the lime is recovered and returned to the kiln. The total high heat requirement per pound of lime would then be:

Calcination reaction at 1500 deg. F.	1220 B.t.u.
Preheating of CO ₂ portion of limestone (recuperative) ...	
Preheating of CaO portion of limestone (credit)	390 B.t.u.

Total heat of high elevation. 830 B.t.u.

The strange thing here is that through preheating followed by cooling, we recover low intensity heat and recuperate it in the cooler to high intensity and thus accomplish a remarkable saving.

Summarizing the three conditions, we obtain:

	B.t.u. per lb. of Lime	Fuel Ratio
High heat stone preheating, no lime cooling.	2230	2.57
High heat stone preheating fully effective cooling.	1610	3.57
Low heat stone preheating, fully effective cooling.	830	6.92

Temperature Conditions Through a Rotary Kiln

In the operation of rotary kilns we know what the gas, lime or stone temperature or the gas analysis is at its approximate terminals. Not much, however, is known of the regions between these points nor of the tem-

peratures prevailing through the mass of rotating material. Ordinarily the points of peak temperature of either the gas or lime are out of range of vision, and even if they were in range, little or nothing is known about the gradient further down through the kiln.

In respect to lime or stone on the slope of the segment, the heaviest pieces tend to roll the farthest and a segregation occurs. Thereafter, the mass tends to roll concentrically. The hottest lime or stone from the surface tends to roll under and into contact with the hot wall and in due time reappears at the top edge of the segment to become again exposed to the radiant heat of the flaming gases.

Thus the largest or heaviest portion of the mass is favored at the expense of the lighter portions, which remain buried deeper within the mass. The lighter they are the deeper they are in the mass, with little chance of becoming exposed to direct heat from either the gases or the kiln walls, being dependent practically entirely on heat derived from adjacent lime by conduction.

As long as the respective sizes fall into a limited range, there is a replacement of the portion rotating on the outside of the mass, when through calcination it becomes unbalanced in weight with the layers underneath, which are heavier, containing more core. If the size range is too great, however, this cannot take place.

Thus there is a great range of temperature through the cross-section of the segment at any point of the kiln and, while the top surface of the lime may be very hot, deep in the mass the available heat is taken up so rapidly by the high core containing portions, that temperatures are barely of calcination intensity. This is hard to believe but must be so or the tendency for the smallest pieces having most core would not be so pronounced.

Similarly, puzzling conditions apply to combustion—how far does it extend and what are the comparative terminal conditions at the end of the calcining zone and at the end of the kiln?

At Bellefonte, Penn., one of the Warner kilns has special openings down its length, so that this subject could be studied. While not exhaustively studied, still some very interesting results have been obtained, which are presented, in part, by Fig. 29.

Stone at the feed end of the kiln heats very rapidly, because the temperature difference between the stone and the gas is very high. One would assume that rapid stone heating would also call for rapid gas cooling, but while the gas does cool, it does so slowly. While the heating rate of stone is represented by a logically curved cooling line, the curve for gas is virtually a straight line.

The flow through the kiln is about

(Continued on page 114)

BWH



DEPENDABLE RUGGEDNESS

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dustry — BWH has pioneered the development of tough conveyor belts and other rugged products of dependability. Look to BWH for the solution to your tough problem!

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Quality Lime

4 lb. of gas per lb. of lime or for each 1.78 lb. of stone. Considering this weight in conjunction with their respective specific heats, then at a fuel ratio of 3.5 to 1 the gases should cool approximately half the amount the stone preheats. Actually, however, the gas cooling rate is not near this figure and may not be more than a fourth of the stone range.

It may be that the stream of gas was cooler at the feed end of the kiln than is shown and the cooling slightly greater, but the stone was not preheated as much as shown either, since the temperature given is that of the stone at the surface, which would be hotter than the average for the mass.

Tests indicate that calcination begins at about 60 to 80 ft. from the feed end. Gas temperature in this region is between 2000 deg. F. and 2200 deg. F., but, if we assume a temperature of only 2000 deg. F. for gas and 1600 deg. F. for stone, again we have the discrepancy of too slow cooling of the gas for the amount of stone passing through.

The reason for this could only be delayed combustion, the burning of gases in the stone preheating zone, thus supplying by combustion some of the heat of preheating and preventing the gases of cooling as one would have the right to expect.

Often kilns flame into the dust chamber. That occurs ordinarily because an insufficient amount of air comes through the kiln for complete combustion, and on contact with leakage air entering at this point, secondary combustion takes place.

Delayed combustion is a different matter; air is present, but mixing is poor, so combustion may extend far into the stone preheating zone, as was demonstrated during these tests.

At testing station X, 60 ft. from the

feed end of the kiln, gases were withdrawn from different cross-sections and analyzed. One sample taken a good distance from the stone surface had a content of 21 percent CO₂, 2 percent O and 4 percent CO. Another taken close to the stone had a content of 32.2 percent CO₂, 1.2 percent O and 3.4 percent CO. The great difference in CO₂ content of the two samples shows how stratified the flow of gases is through the rotary and reveals also that the cooled gases along the stone and lime surface have no tendency to move up and be replaced by hotter streams.

Preferably fuel should only be burned in the calcining zone. Any burned beyond the calcining boundary is lost. One desires complete combustion, with no CO or only slight traces, but that should apply not to the kiln end but rather to the end of the dissociation zone, as the sensible heat of the gases, without any contributed by delayed combustion, is more than ample for stone preheating.

In this case the loss into the preheating zone of combustible gases, sometimes called loss due to incomplete combustion, is very great, as 4 percent CO, when diluted with air and CO₂ from the stone is close to 5 percent CO in straight combustion gases, which in turn means a heat loss equivalent to about 25 percent of that initially available in the carbon.

In the graph, the shaded zone from station X and beyond is a relatively idle zone. Or rather it is not exactly an idle zone, since lime is made to some extent and gases are cooled, but the action is relatively sluggish. Temperature difference is low, brought on by the fact that turbulency is slight and combustion slow.

Lime at this point should be capable of absorbing heat rapidly since

(Continued on page 116)

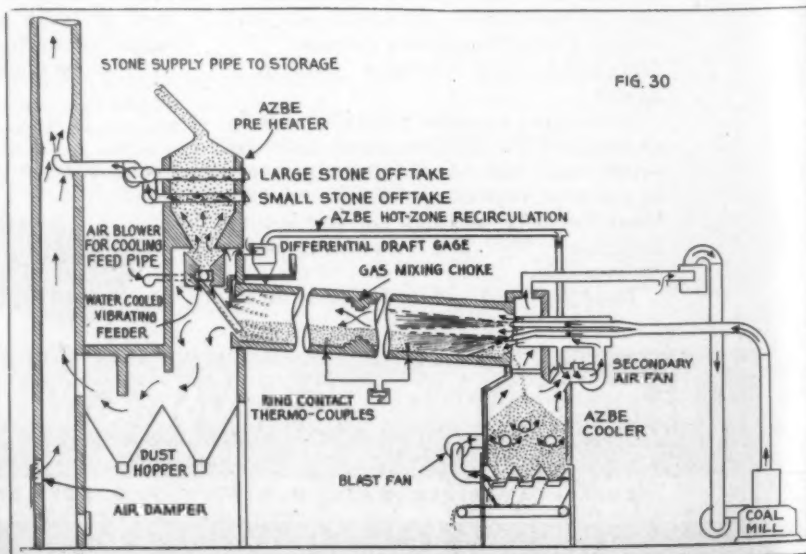
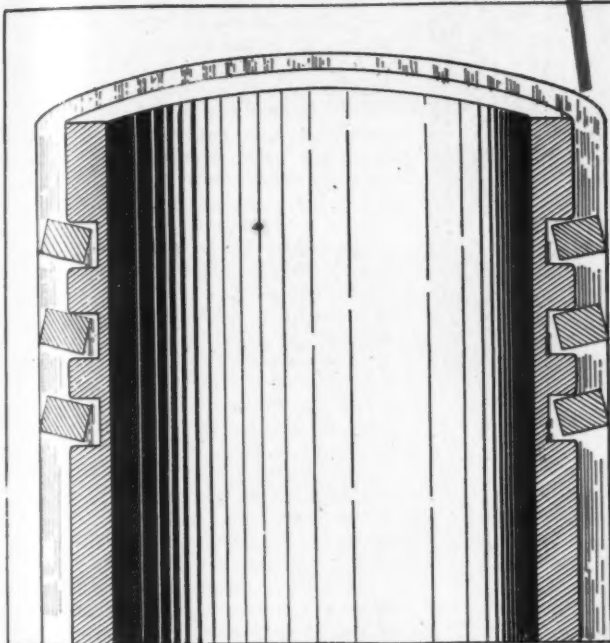


Fig. 30: Schematic arrangement of Azbe rotary kiln system

Diesel Engine **DANGER** points



"ROCKING" PISTON RINGS SCORE LINERS

"Rocking" piston rings, the result of excessive wear in the ring grooves of Diesel engine pistons, are the source of considerable lay-off time and expense to Diesel operators—Wear-enlarged grooves permit rings to rock, and "bite" into cylinder walls. The result is usually a costly overhaul to replace not only pistons, but worn liners as well. It's a danger point in many Diesels—but "rocking" rings and their cause, enlarged ring grooves, can be minimized.

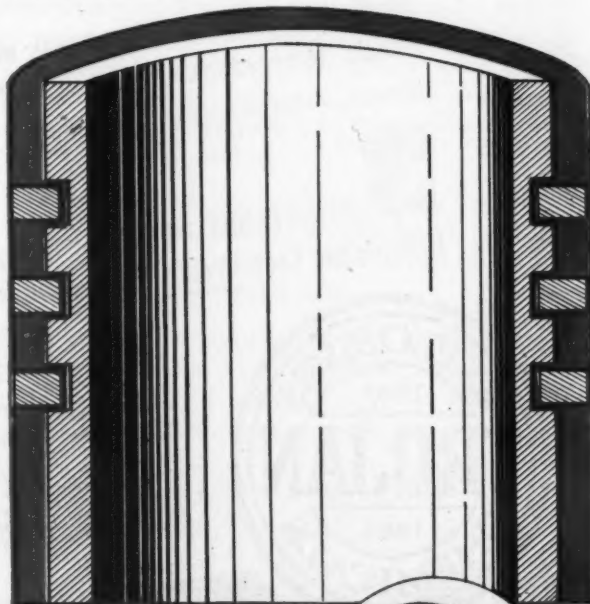
RPM DELO Oil clings to hot engine areas often left exposed to wear by ordinary uncompounded oils.

RING GROOVE WEAR REDUCED BY RPM DELO OIL

In a series of 1000-hour laboratory tests, Standard scientists proved that ring groove wear can be minimized with RPM DELO Diesel Engine Lubricating Oil.

Piston ring groove wear in an engine operated on a top quality straight mineral oil was thirty times that experienced with RPM DELO Oil in an identical test.

RPM DELO Oil reduces wear due to a metal-adhesion additive which makes it cling to and lubricate hot engine areas other oils often leave bare, and to other compounds which eliminate stuck rings and engine deposits, prevent bearing corrosion, stop oil foaming.



To match the fine performance of RPM DELO Oil use these equally efficient companion products from the same famous "RPM" line—

RPM HEAVY DUTY MOTOR OIL
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For additional technical information write Dept. T-X, Standard of California, San Francisco 20, California, or California Commercial Company, 30 Rockefeller Plaza, New York 20, N. Y.

STANDARD OF CALIFORNIA

ROCK PRODUCTS, February, 1946



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(Continued from page 114)

the stone component is preheated to the calcination temperature and lime component is still only a film. However, the stone is not brought up to that point so as to get the heat.

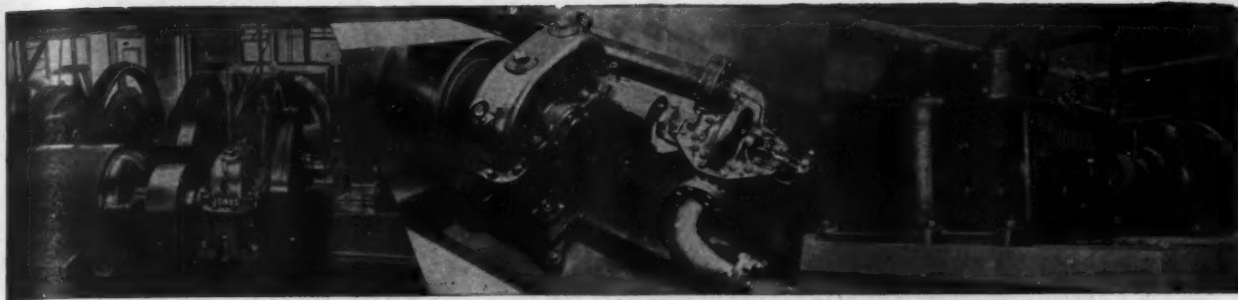
Unfortunately no data were obtained as to the temperature prevailing through the layer of lime and stone. But, considering the dissociation temperature of the stone, its size and heat conductivity, together with the rate of calcination of lime and its conductivity and heat capacity, then, as actually determined, Curve A represents the surface conditions but buried lime and stone surface temperatures could hardly be higher than those shown by Curve B. The center temperature of deeply-buried lime rotating in a small circle in the center of the segment would be represented by C.

The fact that the surface temperature of lime in the idle zone is 2000 deg. F., although calcination has just begun, is because the cool stone is not brought to the surface and there is an idle zone where heat interchange should be high. Sluggish combustion is also a factor.

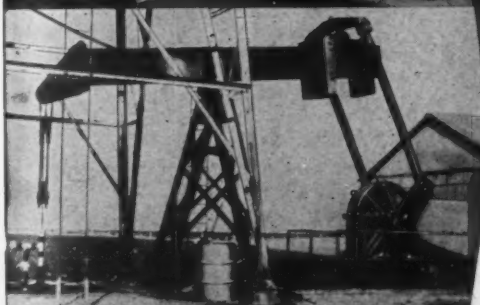
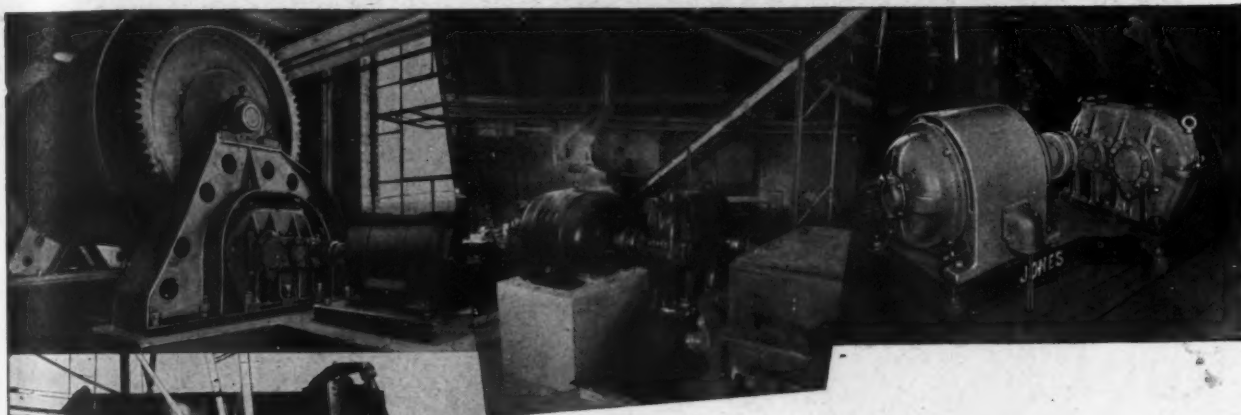
Twenty-five feet from the discharge end of the kiln the temperature of the lime surface and of the gas are at the highest point, although as shown by the CaO curve, calcination is only 80 percent complete. Gas temperature, is very high, 2950 deg., and lime temperature also is 2500 deg. F. With lime at such a high temperature one would expect it to be completely burned, but calcination is only about 80 percent complete, again indicating the great difference which must prevail between the lime surface exposed to the gases or touching the hot wall and the general temperature of that removed from those locations of highest heat. Since lime and stone arrange themselves according to their weight and gravity within the turning mass, it follows that particles never become exposed to the radiations or come in contact with the hot walls.

Rate of penetration of the zone of calcination into an individual piece of stone at 2500 deg. F. is so rapid that in any size of rotary kiln the existence of lime core would not even be imaginable. Even at 2300 deg. F. the rate of penetration is 2 in. per hour, so any 1-in. piece would be lime in 15 minutes. If it is not lime it just means that it was not heated to this temperature at all or not for a sufficient length of time. Most likely it was not, as it is the law of gravity which selects the portion that will travel along with the wall and down in contact with the gas and this will have no core. For the rest, it will receive its heat by conduction from solid to solid, as transfer by convection plays no important part in rotary kiln heat transfer.

(Continued on page 122)



JONES DRIVES FOR INDUSTRY



★ For many years the W. A. Jones Foundry & Machine Company has been called upon as a consultant, to help solve a great variety of difficult drives involving the use of speed reducers, gears and other transmission machinery. In many cases these installations have called for the development of special equipment, designed and built to suit the specific requirements of the project.

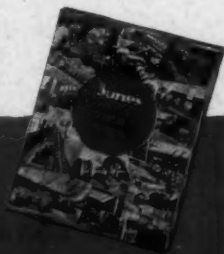
As a result of these years of experience, involving numerous special problems in the mechanical transmission of power, the Jones organization has collected a vast amount of technical data relating to work in various fields.

Specific bulletins and catalogs are available on the products listed below and a general 20 page bulletin "Jones Drives for Industry" presents a broad picture of Jones products, engineering services and manufacturing facilities.

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Ohio Lime Conference

(Continued from page 67)

promotional work and amounts to be spent for it, and best times of the year for sales promotion.

During the discussion that followed, some producers were of the opinion that due to the small margin of profit on agstone, very little money could be spent on advertising without sustaining a loss. It is the duty of the county agent to create a demand in the mind of the farmer. One suggestion was to assess producers on a tonnage basis to get enough money to institute an advertising or sales promotion campaign to be handled by the Association. Another point brought out in the discussion was that better handling methods must be devised before any economy can be received.

Benefits to Livestock Through Soil Treatment

Earl Jones introduced T. S. Sutton, Professor of Animal Husbandry, Ohio State University, as the next speaker. Professor Sutton spoke on "How Liming Benefits Livestock and Livestock Products". He said that the greatest single nutritional deficiency among farm animals is simply not enough food. He summed up his speech with the thought: "The primary benefits to livestock derived from soil treatment including the use of lime is the increase in total feed production. The application of chemicals to the soil beyond what is required for optimum crop production is of questionable value".

The final speaker, R. E. Yoder, chief, Department of Agronomy, Ohio Agricultural Experiment Station, Wooster, Ohio, spoke on "A Year-Round Liming Program". He said that great strides have been made in the past 50 years due to sales promotion, etc., yet with all the advancements made, they still do not equal the loss of farm lands due to leaching, etc. He stated that more lime must be put into Ohio soils to bring them back to proper production capacities. Among the suggestions he made to promote lime sales, were to give bonuses to dealers who sell over a certain amount; improvement of handling materials; consideration of renting spreading equipment to farmers; and stockpiling, which will expedite year round spreading.

After a brief discussion period, the meeting was adjourned. Registration of those attending follows:

Attendance

S. G. Price and G. H. Faist, Gibsonburg Lime Products Co., Gibsonburg, Ohio.

H. O. Beerbower, Rockford Stone Co., Rockford, Ohio.

W. H. Margraf and T. B. McCoy, Marble Cliff Quarries Co., Columbus, Ohio.

Fred Witmer, F. E. Coombs and R. S. Churchill, The Ohio Hydrate & Supply Co., Woodville, Ohio.

Roy C. Chapin and William J. Smyser, J. E. Baker Co., 114 N. George St., York, Penn.

(Continued on page 120)



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G-200 R **LIGHT-WEIGHT** **WAGON DRILL**

AN outstanding feature of the G-200 R Light-Weight Wagon Drill is the sturdy rotary air motor equipped with graduated air control, worm transmission and feed chain — assuring steady feed, quick return and ample power for pulling tight steel.

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Take advantage, NOW, of Deco's specialized flotation experience . . . submit your problems to our test laboratory.



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Established 1881
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Ohio Conference

(Continued from page 118)

J. W. Beam and J. O. Harris, Melvin Stone Co., Melvin, Ohio.
O. F. Meriam, James Eells, Orran Hofstetter and D. G. Davis, Basic Dolomite, Inc., 845 Hanna Bldg., Cleveland, Ohio.
W. P. Fischer, Greentown Lime Co., Greentown, Ohio.
P. E. Heim, Carbon Limestone Co., Youngstown, Ohio.
I. J. Horch, J. and L. Snouffer Co., Dublin, Ohio.
L. G. Young, Tarbox-McCall Stone Co., Findlay, Ohio.
Frank Longabaugh, France Stone Co., Toledo, Ohio.
Charles Raysor and H. T. Williams, Standard Slag Co., Youngstown, Ohio.
V. N. Miller, Pugh Quarry Co., Custar, Ohio.
E. P. Holwadel, Ohio Gravel Co., Cincinnati, Ohio.
C. R. Rex and John Kinerman, Woodville Lime Products Co., Toledo, Ohio.
O. E. Hamilton, J. M. Hamilton & Sons, Marion, Ohio.
A. K. Hausman, Kelley Island Lime and Transport Co., Cleveland, Ohio.
Walter H. Kline, The Piqua Stone Products Co., Piqua, Ohio.
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L. A. Kuenzli, Kuenzli Quarries Co., Upper Sandusky, Ohio.
Paul Ryan, Millard Doyle and Nathan Pendell, Southern Ohio Quarries Co., Columbus, Ohio.
C. L. Rosselot, Owensville, Ohio.
J. K. Conard and C. C. Finch, Ohio Farm Bureau Cooperative Assn., Columbus, Ohio.
E. H. Deibel, Allied Supply Co., Medina, Ohio.
Lester J. Miller, B. & O. Railroad, Columbus, Ohio.
Lee Hays, Pennsylvania Railroad, Richmond, Ind.
C. I. Hummel, Federal Reserve Bank, Cleveland, Ohio.
M. H. Smoke, Knox County Savings Bank, Mt. Vernon, Ohio.
Dale Williams and Robert Miles, A.A.A., Columbus, Ohio.
H. E. Swanson, Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.
Henry Huschke, Natl. Crushed Stone Assn., 1735 14th St., N.W., Washington, D. C.
W. S. Thompson, Ohio Dept. of Agriculture, State Office Bldg., Columbus 15, Ohio.
E. D. Lewis, D. R. Dodd, E. P. Reed, J. B. Page, J. A. Slipper, Earl Jones and D. P. Beard, Dept. of Agronomy, Ohio State University, Columbus, Ohio.
R. E. Yoder and L. E. Thatcher, Dept. of Agronomy, Ohio Agr. Experiment Station, Wooster, Ohio.

Open Quarry

DILLON & SHARPE, contractors from Ottumwa, Iowa, have leased the Gray quarry south of Columbus City for the purpose of producing agricultural limestone and crushed rock for roads.

Buy Equipment

EDWARD R. CAMPBELL, Jr., Vineland, N. J., has installed a new Stearns Clipper block machine. New curing rooms also have been built.

Constructing New Plant

CONSTRUCTION of a new plant for the manufacture of concrete and scoria blocks was started recently at Grand Coulee, Wash., according to H. Buchholz, engineer.

Grinding Pebbles

(Continued from page 78)

dust. At the expiration of the grinding period, the pebbles are removed and placed in open bins ready for shipment. This processing removes sharp corners and edges and leaves the pebbles in a smooth cubical shape which is essential for grinding mills which process feldspar, etc.

The liners, cut to correct size at the quarry, are made in various sizes, ranging from 8- to 12-in. in length. The other dimensions are 2½- x 5-in.; 3- x 5-in.; 4- x 5-in.; and 5- x 5-in. They are stocked at the quarry and are ready for shipment with no further processing. Pebbles are manufactured in several cubical sizes, from 1½- to 2¼-in.; 2- to 2¾-in.; 2½- to 3¼-in.; and 4- to 5-in.

This company has shipped both products to many States in the Union as well as to Mexico, Canada, and South America. Purchasers are producers of silica sand, feldspar, phosphate rock, paper pulp, asbestos, paint pigments, and some pebbles have been sent to optical works. While these products were originally only a necessary substitute for an unattainable grinding media, several advantages have been claimed for them, including better rough grinding qualities and greater durability.

By-Product of Monumental Stone

The principal production of the Harris Granite Quarries Co. is monumental stone, although in recent years crushed stone has become an important item. This company has been producing stone since 1903 and has five quarries comprising 700-acres near Salisbury. R. W. Harris is president of the company; J. E. Ramsay is vice-president and general manager; R. G. Hunt is treasurer, and Meade Fraley is secretary.

The chemical analysis of the "Balfour Pink" granite follows:

Silica	76.06 percent
Titanium oxide .....	.12 percent
Alumina	14.10 percent
Iron oxide	1.20 percent
Manganese oxide .....	.20 percent
Lime .....	.36 percent
Magnesia	None
Soda	2.01 percent
Potash	6.00 percent
Phosphoric anhydride .....	.08 percent
Sulphuric anhydride .....	.18 percent
Loss on ignition .....	.12 percent

Total100.43 percent

Absorption: The water absorption is low and is recorded as one part of water to seven hundred seventy-two parts of stone by weight.

Opens Quarry

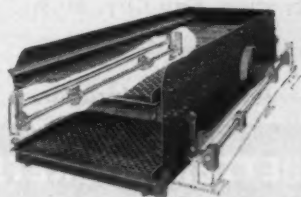
OSCAR FREDEN of Chicago has opened a stone quarry near Blair, Kans., for the production of rip rap, crushed stone, and agricultural limestone.

Here's Why Profit-Minded Operators Everywhere Choose SECO Vibrating Screens

There's a right SECO for your needs

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1 Results count! Yes, day after day performance records piled up by Seco screens over the last eight years on all types of installations prove conclusively their ability to screen more tons per hour. Here's how.



SINGLE DECK

Patented Equalizer Assembly

2 This basic engineering advantage makes the difference! Seco and only Seco has a fully controlled true circular action—that never varies—with less maintenance, keeps every inch of screen surface working at all times.

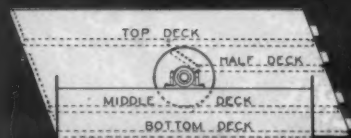


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No Bobbing • Galloping or Weaving

3 There's no lost motion—no slowing up of the load—blinding is kept to a minimum—and just think how much longer a Seco screen will hold up on the job with less maintenance—because there's no excess strain on any one part. Get more production per hour—per month—per year. Get a SECO!



THREE AND ONE HALF DECK

To scalp a small amount of oversize and make 3 finished sizes as well as fines.

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BROWNHOIST BUCKETS

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**OVER 25 YEARS
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Manufacturing Lime

(Continued from page 116)

Before we developed a grievance against the ordinary rotary kiln, with its improper mixing of gases and sluggish long-delayed combustion. Now we have another—improper mixing, but, in this case, of the solid component, a condition which exists all through the kiln and may be more harmful even than too slow gas mixing.

Between the hottest point of the kiln and its discharge end, a further peculiar condition exists. While gas temperature is rising very fast, lime temperature is dropping, even after calcination is complete. Since calcination is complete, or almost so, the temperature should remain high.

In explanation of this we may assume that air delivered through the fuel pipe, combined with the combustible, constitutes the flame. Its temperature was measured. Surrounding this inner core of the gas stream is the secondary air entering the kiln, either through the cooler, the seal ring, or the many openings in the front of the hood. It is this secondary air which cools the surface of the lime appearing at the upper surface and this in turn cools the rest of the lime in the mass.

If more air would enter as primary air through the burner, lime would stay hotter longer. If almost all could enter in this way, it would remain at the heat it was brought to. To cool lime in the kiln is economically unsound. Lime should be cooled in the cooler.

If more air would enter as primary air, or if secondary air would be made to enter closely adjacent to the primary stream, the temperature peak would not be as high and would be longer. The chances are very much that the hottest point would be within the fireman's range of vision, which is not so now.

As it is, the primary stream enters at high turbulency, being slowed up immediately by the secondary stream. Entering together, they could be given a rotary action which would carry through far down the kiln and tend to remove cooled gases from the lime surface and replace them with hot gases. Combustion would also be complete earlier.

This entire study indicates that, of the handicaps the rotary kiln is subject to, poor mixing of gases, poor mixing of lime and poor mixing of stone, poor mixing in short, is as serious or close to it, that the kiln cannot take advantage of heat transfer by convection and is dependent only on radiation and conduction.

Mixing improves any heating or combustion apparatus, whether it be a stew pan or a 1000-hp. boiler, and the rotary kiln is no exception to it. A dam at the discharge end helps in building up the load and its surface and time of travel, but it does not

help mixing. Other chokes through the kiln would, however, not only build up the load for other stretches but would also break up stone stratifications and would tend to mix the gases through this baffling effect, tending to more complete combustion earlier and mixing of the cool stratas adjacent to lime with the very hot from the upper kiln cross-section.

Such chokes would also function as curtains, in a measure shielding the hot zone from excessive loss of heat by radiation into the cooler sections of the kiln. They should help provide the loss of draft through additional flow resistance and would not undo the good.

High Efficiency Rotary System

Rotary installations can be of many degrees of perfection, from the simplest, crudest kilns, unelaborated by any preheaters, coolers, gas mixing chokes, or special firing systems, to what one may call the apex of perfection shown in Fig. 30. Beyond this there seems no further possible improvement except by complete elimination of the rotary, through the joining of the preheater with the cooler in some form of a vertical kiln embracing the required features to burn small stone properly.

The sketch shows the gas mixing choke and other previously discussed features, also the new AZBE stone preheater, made possible through the use of a water-cooled vibrating feeder. It shows the AZBE lime cooler, which allows for full control over air distribution, also over the lime withdrawal from different sections of the cooler.

Twin Burning System

The twin burning system previously advocated, the concentric rotatory secondary air admission, together with the AZBE System of Hot Zone Recirculation, will work for kiln conditions conducive not only to prolonged heat transfer but control as well. Thus on one hand the highest efficiency is secured, through proper stone preheating, proper lime cooling and through complete combustion within the calcining zone, while on the other, calcination is prolonged and equalized through the entire rotary section for a resultant higher quality of lime.

The gas mixing choke probably should be identified as "stone mixing," as it would have a greater effect in that way, holding back the slower heating buried smaller sized portion and speeding up the exposed portions.

In this system, great reliance is placed upon the highest possible speed as much as up to 35 seconds per revolution if possible.

With this we complete presentation of the Canadian paper in somewhat abbreviated form, with the exception of the subject of hydration which will appear later, independently, and presented with proper emphasis.

1 NEW HOLLAND CRUSHER DOES 2 JOBS FOR INDIANA LIMESTONE PLANT

● One New Holland Model 3030 Double Impeller Crusher is doing both the PRIMARY and SECONDARY crushing at the McCorkle Stone Co., Milroy, Ind., agstone plant. Because it successfully crushes run of the quarry stone as large as 30" to an optional minimum of 80% minus 1", the 3030 crusher is doing the whole pulverizing job for McCorkle. At present, the crusher is producing approximately 40 tons per hour of agricultural limestone, but company officials report it will easily reduce stone from 30" to 1" at the rate of better than 100 tons per hour.



This 3030 double impeller crusher will do the same job for you in your stone crushing plant. You'll like the low maintenance costs. Wearing parts are designed for quick, inexpensive replacement. Write to Dept. RP-2 for details.



HOW IT WORKS

Impacting action of the two gigantic impellers, operating clockwise and counterclockwise, strikes the stone in midair as it enters the crusher. Material is thrown upward against the breaker bars and rebounds to the impellers. This process continues until the stone is reduced to the required size when it passes around the impellers and out

through the discharge openings. Impellers travel at adjustable speeds of 250 to 1000 rpm. Size of finished product is easily and quickly controlled. Manganeese steel impeller bars have four striking forces and are made to be reversed when worn.

Write Department RP-2 for complete information and specifications on the Model 3030.

The New Holland Machine Company also manufactures roll and hammer crushers, vibrating and revolving screens, conveyors and elevators, and portable crushing units. Literature on request.

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PENN-LEHIGH and SUPER-PENNSTEEL Primary and Secondary Single Rolls assure uninterrupted low-cost crushing of Cement-making Materials, Limestone and Gypsum.

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This advanced REVERSIBLE type is specialized for the fine preparation of Cement-making Materials for grinding, Limestone, Lime and Gypsum for processing, and the low cost manufacture of Agricultural Limestone. Fifteen (15) sizes meet all requirements.

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FAST, CHEAP MATERIAL HANDLING with SAUERMAN CRESCENT SCRAPERS



ECONOMICAL STOCKPILING

Picture shows how one-man Sauerman Scraper System handling a 25,000-ton stockpile of phosphate rock at Florida drying plant. Operation is changed quickly from storing to reclaiming. Operating cost about 3c a ton handled.



CRESCENT SCRAPER BUCKET

Exclusive feature of Sauerman Scraper Machine is Crescent bucket which handles large loads faster and with less line-pull than any other scraper

THREE main economies are assured by using Sauerman Scraper Machines for long haul work such as moving loose materials out of pits or ponds, stripping, stockpiling, bank excavation, etc. These economies are:

- (1) Digging, hauling and automatic dumping are merged into a continuous, rapid operation controlled by one operator.
- (2) Power requirement is moderate.
- (3) Maintenance is simple.

Sauerman machines offer handling capacities from 10 to 1,000 tons per hour and operating spans from 200 to 1500 ft. Specifications of the various sizes and types of machines, together with illustrations of their uses are given in the Sauerman catalogs. Write for this literature today.

SAUERMAN BROS., INC.
530 S. Clinton St., Chicago 7, Ill.

High Alkali Cement

(Continued from page 73)

accepted as a measure of the soundness of concrete specimens, this loss shows that these structures have far less a factor of safety than they were designed for.

However, a factor of more practical importance is the gradual swelling of the entire structure, as evidenced by the displacement of foundations for turbines and electric generators, breakage of deflecting vanes, sticking of valves, etc. This damage has been so extensive in some installations as to require new foundations so constructed as to be unaffected by continued swelling of the concrete in the dam structure.

Very appreciable movement or increase in crown deflation of curved dams has been measured, showing that the swelling was taking place in the entire structure. Since, as yet, not much is known definitely just what aggregates are safe from such reactions—one authority says pure limestone is the only sure one—the authors draw the conclusion that limiting the alkali ($\text{Na}_2\text{O} + \text{K}_2\text{O}$) to 0.60 percent is the only precaution that can be taken. With highly alkali cement, in some cases reaction has been delayed for 20 years; in other cases, as in Parker dam, it shows itself in a very few years.

The authors also say that in specifying and purchasing low alkali cement, from the same manufacturers as before, they have gotten better cement in other respects. In most cases the reduction in alkali content was accompanied by marked reductions in C_3AF and lower C_3A , while C_2S and C_3S were increased as much as 9 percent. They say the extra cost of low alkali cement up to 20c. per bbl. over that of normal cement is more than repaid in the improvement in quality alone.

Portland pozzolanic cements may be safely used with reactive aggregates, according to indication of tests. Where war-time conditions required the use of a high alkali cement for part of the Friant dam, Central Valley, California, 20 percent by weight of the cement of a fine pumicite was used as a concrete ingredient.

Discussion

In the September, 1945, *Proceedings* of the Society there are discussions of this paper by most of the engineers who have had experience with the same troubles. Ralph R. Proctor, Department of Water and Power, City of Los Angeles, thinks that dissolved carbon dioxide (CO_2) is a factor. He says he visited a cement plant that was producing a low-alkali cement for one large purchaser, sulphate-resistant cement for another, and a "Merriman" type for a third, all from the same clinker. Furthermore this cement met all three specifications. Apparently, Mr.

Proctor says, the essential characteristic of this clinker was determined by the proper temperature of the kilns during burning,—a point that the late Mr. Merriman made a great point of, and for which his sugar test was designed.

Mr. Proctor thought it was inconsistent to add reactive admixtures to concrete mixtures, when attempts were being made to eliminate reactive aggregates. [Evidently he referred to the Friant dam concrete, previously mentioned. But experience seems to show that it is only the reactive coarse aggregate that makes trouble.—Editor.]

The rest of the discussion concerned mostly the types of rock and gravel which have given the most trouble. It seems to be the opaline (hydrated) form of silica, regardless of what mineral it occurs in, that gives the most trouble. The general over-all conclusion seems to be, that so far as present knowledge goes, it is reasonably safe to use these aggregates in combination with low alkali cements.

New Incorporations

Barcla Quarries, Inc., 595 Legion Ave., New Haven, Conn., has been incorporated. 600 shares of common stock have been subscribed for, on which \$40,000 cash and \$20,000 in property have been paid. President, Joseph Barone, 35 shares; vice-president, Dominick Barone, 35 shares; secretary-treasurer, Frederick F. Clark, all of New Haven, 35 shares. Directors are officers and W. A. Thomson, Hamden, Conn., 10 shares. Amended certificate of organization. Stockholders: Clark-Barone Co., New Haven, 185 shares; C. I. Clark, New York City, 150 shares; and others.

Connecticut Asbestos Products, Inc., Farmington Ave., Kensington, Conn., has been organized. 200 shares of common stock have been subscribed for, on which \$9000 cash and \$11,000 in property have been paid. President, Hans Wirth, Middletown, 99 shares; vice-president and treasurer, Gerard J. Kluykens, 99 shares; secretary, Thomas H. Schultz, 1 share, both of New York City. Directors are officers, and Anna M. Wirth, Middletown, 1 share.

Vineyard Redi-Mix Concrete Co., Inc., Beach Road, Vineyard Haven, Mass., has been incorporated with a capital of 1000 shares of common stock, par value \$100. President, W. Frederick Richard; treasurer, Marion K. Hazlett; Clerk, Irene M. Frazer.

Grove Sand & Gravel Co., Union Grove, Wis., has been organized to deal in sand, gravel, and cement products. Capital consists of 100 shares of stock, no par value. Incorporators are Paul and Arthur James, Louis Rouniker, H. H. Brown, Union Grove, is correspondent.

Midway Sand & Gravel Co., Kent, Wash., has been organized. Incorporators are James Louis and Nick Romano, Route 5, Box 10, Kent, Wash.

WELDING—Welded Steel Shapes, Inc., has released a new brochure for executives and engineers, describing and illustrating the advantages of structural steel welding. Practical applications of specialized service are also shown.

The NEW LEADER leads the field again

New design • All Steel • Longer life spreader



Check all these features and compare them with any spreader on the market today.

- Gear boxes driving distributor discs are equipped with steel-cut gears and ball bearings running in dust proof and oil tight gear cases. Large gear box driving wide bottom chain conveyor is equipped with a steel ring gear and pinion. A thrust ball bearing, also running in a dust proof and oil tight gear case.
- New style conveyor is 24 inches wide.
- Extra heavy duty pintle type conveyor chain is used.
- Feed gate which determines thickness of spread now controlled by a lever easily reached from cab of truck.
- Check and compare size of shafting, thickness of distributor discs, size of roller chain, heavier pintle chain.
- Most important! Notice slope of spreader box.

• With this new style, extra-wide bottom spreader you will be able to handle all types of lime, either wet or dry, and even marl—which is usually extremely wet.

No vibrator is required and no one is needed to push down the wet lime. All you do is adjust the feed gate to the number of tons desired per acre and The NEW LEADER takes care of the rest.

Easy maintenance. . . . Rugged construction. . . . More profit . . . when you own and operate THE NEW LEADER SPREADER.

Write for prices, delivery and dealer in your territory. Some territories still open for dealers.

HIGHWAY EQUIPMENT COMPANY, INC.

Cedar Rapids, Iowa, U. S. A.

Phone 32017-32018

Manufacturers of the world's most complete line of spreaders.

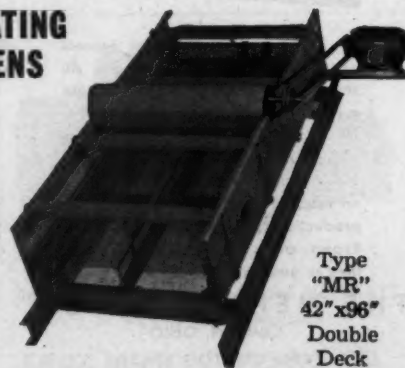
NOTICE: Spreaders also available in all steel box, except hopper or spreader box of wood. Both sides and front end and back out of wood instead of steel.

UNIVERSAL VIBRATING SCREENS

give best results

Guaranteed to give you best results on your most difficult separations. UNIVERSALS are of rugged yet simple construction, lowest in first cost and in maintenance. UNIVERSALS have been tried and proved in 25 years of dependable service.

Write for 32-page catalog on screens and screening.



Type
"MR"
42"x96"
Double
Deck

★ ★ ★ **UNIVERSAL VIBRATING SCREEN CO.** ★ ★ ★
RACINE -- WISCONSIN



Made of
Acid Open Hearth
Steel Wire

**Round Strand
Flattened Strand
Preformed
Steel Clad
Non-Rotating**

The Service Record of this
wire rope continues to make
and hold friends.

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.

Established 1857

5909 Kennerly Avenue

St. Louis, Mo.

New York — Chicago — Denver
San Francisco — Portland — Seattle



**THERE'S BIG
BUSINESS IN
THE OFFING**

● That's right — the next several
years should be bumper-years. All
the more reason to equip to handle
a full share.

N & F super-concrete slave bins
will give you bulk storage and auto-
matic handling of materials—save
on labor, reduce truckage, increase
production, pay for themselves.
Expert crews will erect them and
they're guaranteed. Any capacity.

THE NEFF & FRY CO.

CAMDEN, OHIO

1946 CATALOG READY

BULK STORAGE BINS

FINANCIAL

RECENT DIVIDENDS

Medusa Portland Cement Co.	\$.50	Dec. 27
Medusa Portland Cement Co. pfd.	1.50	Jan. 2
Superior Portland Cement Co. ....	.75	Dec. 23
Kelley Island Lime & Trans. Co. ....	.20	Dec. 21
Arundel Corp. ....	.25	Dec. 27
Arundel Corp. ....	.50	Dec. 27
Missouri Portland Cement Co. year-end ....	.50	Dec. 20
Dolese & Shepard Co. ....	.50	Jan. 2

SCHUMACHER WALL BOARD CORPORATION, Los Angeles, Calif., has been merged into Paraffine Co., Inc., on a basis of exchange of shares, one share of Paraffine for each three shares of Schumacher common. In connection with this arrangement, Schumacher Wall Board Corporation has called for redemption on February 15, 1946, at \$30 a share its 27,330 shares of no par \$2 cumulative participating preferred. A loan of \$700,000 by Paraffine to Schumacher, maturing Dec. 31, 1946, has been arranged to assist in this retirement, for which 60 days' notice before dividend date is required. The retirement will require about \$820,000 plus dividend.

Paraffine on last showing already owned 21,000 shares or about 32 percent of Schumacher's 66,000 shares of common stock in addition to which more than 5,000 shares additional were recorded to officers of Schumacher and Paraffine companies.

Paraffine and Schumacher have been closely affiliated and it is considered by the managements that the position will be strengthened by the consolidation. Schumacher, which produces plaster board and building materials at a plant built in 1940 at Southgate near Los Angeles, reported \$1,360,290 of assets as of April 30, 1945.

NATIONAL GYPSUM Co., Buffalo, N. Y., reports that sales in 1946 should rise \$5,000,000 to \$32,000,000, according to President Melvin H. Baker. Net profit, he reported, on the larger volume should be increased substantially through economies in transporting materials from Nova Scotia and the manufacture of part of its own paper requirements. He predicted that sales in 1947 may reach \$40,000,000.

YOSEMITE PORTLAND CEMENT Co. directors recently declared the third liquidating dividend on preferred stock at the rate of 75c a share, payable December 17. Ultimate liquidation on the stock is estimated at approximately \$7.50 a share.

PENNSYLVANIA-DIXIE CEMENT CORPORATION, New York, N. Y., announced that stockholders have approved a recapitalization plan which calls for a merger of the company with the

CONTROL YOUR PRODUCT



with the

GILSON MECHANICAL TESTING SCREEN

● Prepare for post-war competition with this modern testing equipment. Operation is smooth and quiet. Separates accurately up to one cubic foot of concrete aggregate in five minutes or less. An attachment is available for vibrating standard sand sieves. Write for complete information.

THE GILSON SCREEN COMPANY

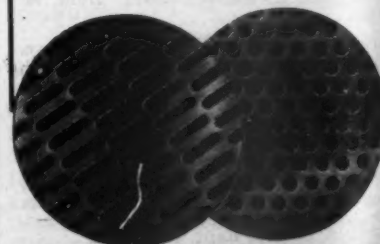
P. O. Box 186, Mercer, Pa.

SPECIFY HARRINGTON & KING

PERFORATED METAL SCREENS

H & K screens are noted for their durability and long service. They are designed for maximum screening capacity of products to meet exacting specifications and to serve well and long. Make your next screens Harrington & King.

Write for illustrated catalog.



Harrington & King
PERFORATING CO.

5650 FILLMORE ST., CHICAGO 44, ILL.
114 LIBERTY ST., NEW YORK 6, N. Y.

General Cement Corporation, its wholly owned subsidiary.

Holders of 121,200 shares of \$7 preferred stock, on which arrears were \$100.04 a share on Sept. 30, will receive four new common shares for each share, and holders of 400,000 common shares will receive for each share one-tenth share of new common stock and warrants to purchase one-fifth share of new stock. Application will be made to list the warrants on the New York Curb Exchange.

The warrants entitle the holder to purchase new common stock at \$20 a share from June 1, 1946, to May 31, 1949, inclusive. If all warrants issued are exercised, the company will have 604,800 new shares outstanding.

Victor N. Roadstrum, chairman, said at the meeting that the board of directors intend to establish a policy of regular dividend payments as promptly as justified by results. He estimated that company may earn \$1,500,000 after taxes next year if labor problems and material shortages are dissipated, or the equivalent of about \$2.50 a share on 604,800 shares.

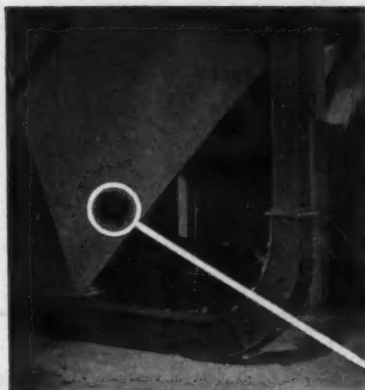
PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., has reported the approval by stockholders of an authorized issue of 30,000 shares of new \$100 par cumulative preferred stock, of which an initial series of 15,000 4½ percent convertible preferred shares has been registered with the S.E.C. for public offering under an expansion program. This expansion program includes \$700,000 for a new aggregate plant at Elliot, Calif., \$300,000 for a new aggregate plant to replace the plant at Riverrock, Calif., and about \$420,000 for plant improvements and additional warehouse facilities.

Virginia Limestone Reports

VIRGINIA STATE GEOLOGICAL SURVEY has been making an intensive investigation of the industrial limestones of the State. Dr. Arthur Bevan, State geologist of the Virginia Conservation Commission recently announced the completion of four field projects on limestone. Survey Bulletin No. 62 on the New River-Roanoke River district has just been published and reports on two other projects will be available shortly. The reports, which describe and enumerate analyses of the limestones can be obtained from the Survey office at Charlottesville.

Named College Trustee

CLARENCE R. WOLF, president of the New Jersey Silica Sand Co., and general manager of the National Pulverizing Co., both of Millville, N. J., has been elected a life trustee of Lafayette College, Easton, Penn.



SYNTRON

"Pulsating Magnet"

ELECTRIC VIBRATORS

... make stubborn materials flow freely

3600 powerful "Electronic Controlled" vibrations per minute break down arching and plugging

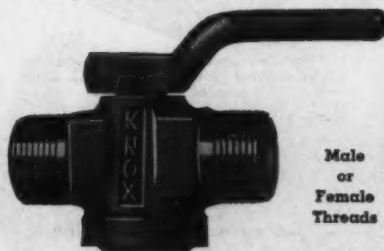
of sand, gravel, rock, etc.—without damage to prime equipment.

8 models, each with rheostat control of power—from a little 4-lb. size up to big 500 lb. models. Capacities from 1 cu. ft. hoppers to 100 ton bins. Operate on 110, 220, 440 volt AC current.

Write for catalog information

SYNTRON COMPANY

450 LEXINGTON AVENUE • HOMER CITY, PA.



Since 1911 Producers of

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Valves-Couplings-Nipples-Clamps-Menders

Recognized Universally as the **ULTIMATE** in Valves and Couplings

KNOX MANUFACTURING CO.

818 CHERRY ST., PHILADELPHIA 7, PA.

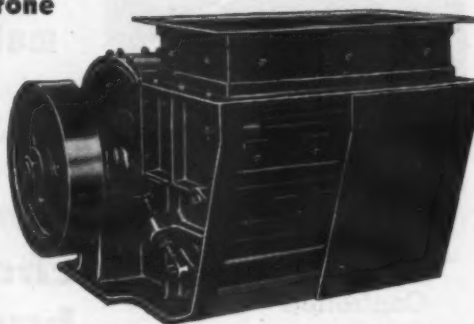
GET TONNAGE PLUS A UNIFORM PRODUCT

with AMERICAN CRUSHERS

Great Flexibility for ag-
stone fineness or roadstone
coarseness

Americans produce a uniform fineness or a uniform coarseness with a minimum of unwanted fines and no oversize. Their wide range of reduction provides a one-step operation from one-man stone—or a highly efficient closed-circuit reduction of breaker sizes. Americans assure a low operating cost with capacities up to 250 TPH.

Of rugged, dust-tight sectional construction—easily dismantled for moving and re-assembly.



Get all the facts on American Crushers for your operation. Informational bulletins sent upon request.

American PULVERIZER COMPANY
Originators and Manufacturers of
Ring Crushers and Pulverizers
1245 MACKLIND AVE.
ST. LOUIS 10, MO.

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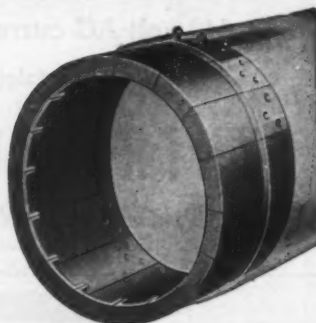
Burn-Outs KILL PROFITS

PYRASTEEL KILN ENDS

... prevent costly burn-outs and shutdowns that result in serious loss of production.

Install PYRASTEEL Segmental Kiln Ends at *both* the discharge and feed ends of your cement kilns, and be assured of long, dependable, and economical service.

Write for Bulletin of This
Heat-Resisting Alloy



Showing discharge end of cement kiln fitted with PYRASTEEL Segmental Kiln Ends.



Unit segments are easy to install or replace.

CHICAGO STEEL FOUNDRY COMPANY
PYRASTEEL
for high temperatures
KEDZIE AVE. & 37th ST.
CHICAGO 32, ILL.
Master of Alloy Steel for 32 Years
EVANSTEEL
for strength

Manufacturers' News

Parry Engineering Co., New York, N. Y., representatives of the Prat-Daniel Corp. and Thermix Engineering Co., announces that Capt. Henry L. Parry, who organized the company over 15 years ago, has returned from five years of service in the U. S. Navy, mostly in the South Pacific. During Capt. Parry's absence, the business was under the management of Howard B. Keppel, partner. Clifford J. Heath, specialist in industrial dust problems, and Donald Spangler, former Lieutenant in the U. S. Army Air Forces, have joined the sales staff of the company.

Caterpillar Tractor Co., Peoria, Ill., has made the following advancements in the research department: Dr. L. A. Blanc, W. L. H. Doyle, C. R. Maxwell and C. R. Schad have been promoted to positions as assistant directors of research. Dr. Blanc is in charge of physical, chemical, combustion and metallurgical projects; Mr. Doyle is supervisor of special investigations and general research projects; Mr. Maxwell is in charge of Diesel engine, combustion systems and fuel inspection development projects; and Mr. Schad is in charge of duties of organization, personnel and operational activities.

Hercules Powder Co., Wilmington, Del., announces that C. C. Gerow, first director of sales, has retired after more than 47 years in the explosives industry. Mr. Gerow was one of the first three men employed by Hercules when the company was formed in October, 1912, at which time he was appointed assistant to J. T. Skelly, vice-president in charge of sales. Late in 1918, he was made sales manager, and when the company was divided into operating departments in 1928, Mr. Gerow became director of sales of the explosives department. Leroy Keane, who was recently appointed director of explosives sales, will succeed Mr. Gerow.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has promoted Clalborne C. Van Zandt to assistant manager of the crushing, cement and mining section of the basic industries department. Fred W. Bush has been made assistant manager of the electrical department, and Frederick C. Ludington has been appointed manager of the switchgear and control sections.

Bemis Bro. Bag Co., St. Louis, Mo., has announced the opening of a new textile bag manufacturing plant at Los Angeles, Calif., in a building just being vacated by the Consolidated Vultee Aircraft Corp. C. H. Dekker has been appointed manager. He has been with the company for 23 years and in charge of the Los Angeles sales office since 1939. The new plant will serve Southern California, Arizona and Nevada.

Bigelow-Gibson, Inc., Toledo, Ohio, has opened a new distributorship for Hewitt Rubber Corp. products at 1026 Water St., Toledo, to cover parts of Ohio, Indiana and Michigan. Samuel J. Gibson is president, and Warren C. Bigelow is vice-president.

Brown-Bevis Equipment Co., Los Angeles, Calif., announces that James H. Tiller, Jr., has been appointed manager of the Phoenix, Ariz., office. He was formerly southern district manager for Barber-Greene Co.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the resignation of William H. Knight as manager of the Duluth, Minn., branch sales office. He will be succeeded as manager by John G. Barta of the Milwaukee district office.

Diesel Engine Manufacturing Association announces that E. J. Schwanhauser, vice-president of Worthington Pump & Machinery Corp., has been elected president of the association. Gordon Lefebvre, president of Cooper-Bessemer Corp., and J. E. Peterson, vice-president of General Machinery Corp., were elected vice-presidents; Robert H. Morse, Jr., vice-president and general manager of Fairbanks, Morse & Co., was reelected treasurer; Harvey T. Hill, executive director of the association, was reelected to serve through 1946. New directors are: A. W. McKinney, vice-president of National Supply Co., and G. P. Twist, vice-president and general manager of Atlas Imperial.

Continuing on the board of directors are George W. Codrington, vice-president of General Motors Corp.; Charles E. Brinley, chairman of the board, Baldwin Locomotive Works; Robert E. Friend, president of Nordberg Mfg. Co.; Norris H. Schwenk, president of Busch-Sulzer Bros.-Diesel Engine Co.; Mr. Schwanhauser, Mr. Morse and Mr. Lefebvre.

Hercules Powder Co., Wilmington, Del. announces that Bernhart Troxler, smokeless powder production adviser for the company, has retired after 32 years of service. Mr. Troxler started with Hercules in 1913 as smokeless powder superintendent of the Kenil, N. J., plant, and since 1941 has served as production adviser on smokeless powder manufacturing. He has been in the smokeless powder business for 45 years, and is the holder of numerous patents covering explosives products.

E. I. duPont de Nemours & Co., Wilmington, Del., has announced the retirement of P. C. Kaiser as manager of the Repauno works and the appointment of J. W. Klits, production manager of the military explosives division, as his successor. Announcement has also been made of the retirement of C. A. Woodbury, manager of the technical division, and I. J. Cox, manager of the American glycerin section and production manager of the black powder section. Mr. Woodbury will be succeeded by Dr. B. H. Mackey, and the duties of Mr. Cox will be taken over by G. H. Loving, an assistant director of sales of the explosives department, and those in the black powder section will be taken over by H. K. Babbitt, production manager of the special products section.

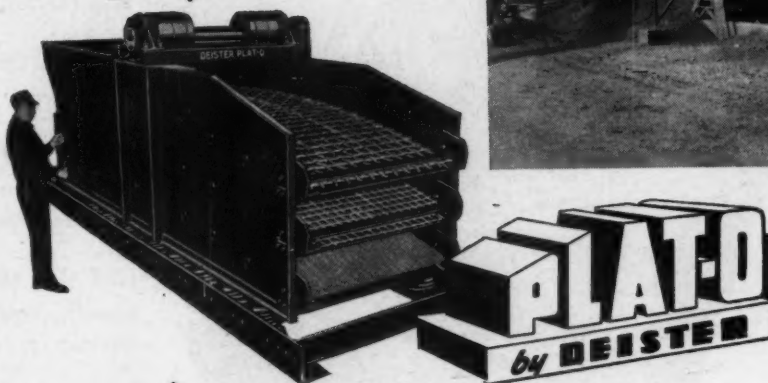
M-R-S Mfg. Co., Jackson, Miss., has appointed Conger H. Jones as service manager. Mr. Jones served as a captain of field artillery in the U. S. Army. Mr. Jones recently received his discharge as captain of field artillery in the U. S. Army after five years of military service including 25 months in the Mediterranean and European theaters. He was formerly connected with the service department of the General Electric Supply Corp., Memphis, Tenn.

Gar Wood Industries, Inc., New York, N. Y., has elected George D. Shaeffer, formerly chief engineer, to the post of vice-president in charge of engineering. He joined the company in 1938 as chief engineer of the road machinery division, after having served as chief of the road machinery engineering department for Allis-Chalmers Mfg. Co. for two years.

Caterpillar Tractor Co., Peoria, Ill., announces that Commander Burt Powell, former news editor of the company, has returned as a member of the sales department following four and one-half years of service in the U. S. Navy. He has been associated with the company since 1935.

Fuller Co., Catasauqua, Penn., announces the removal of its Chicago district office to 120 S. La Salle St., Room 1951. C. C. Kaesemeyer is the manager in charge.

**45 Tons
-in seven
minutes**



This rugged 5' x 12' Plat-O Vibrating Screen averages better than 270 tons of virgin feed, plus 30 tons of circulating load every hour... handles a 45-ton load of rough feed straight from the pit in exactly seven minutes... is doing a tough job with characteristic Plat-O speed, economy and dependability.

Installed as part of the modernization program at Kickapoo Sand and Gravel Company at Peru, Indiana, it helped Kickapoo increase production 400%

in one season... from 5 railroad cars to 20 or more cars a day. It sized 150,000 tons without a screen change... has required no service other than quick, easy day-to-day maintenance.

This is the kind of results operators everywhere report with Plat-O Vibrating Screens... results that mean better sizing—cheaper. Why not let Deister Machine Company Engineers show how you, too, can boost profits and production with Plat-O Vibrating Screens?

DEISTER MACHINE COMPANY • Ft. Wayne 4, Ind.

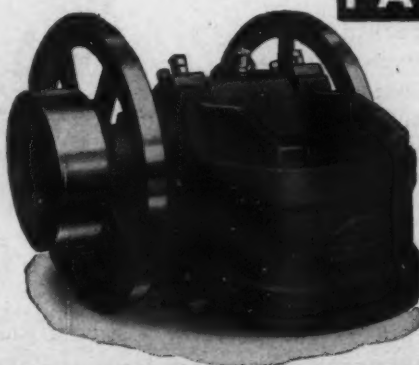
FARREL-BACON

CRUSHERS

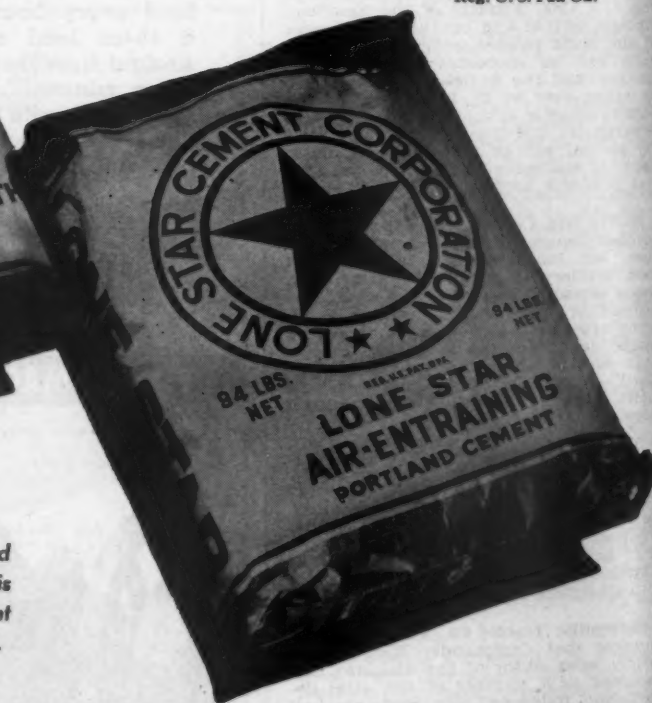
Complete plants designed and equipped, including Screens, Elevators and Conveyors. Machinery for Mines and Rock Quarries, Sand and Gravel Plants.

Engineering Service

FARREL-BACON
ANSONIA, CONN.



QUALITY SPELLS Performance



SELLECT cement for concrete that fits the job . . . use these three quality Lone Star Cements for utmost strength and durability:

LONE STAR CEMENT for outstanding performance on all types of concrete work . . .

'INCOR'* 24-HOUR CEMENT, where reduced curing time and dependable high early strength provide important advantages . . .

LONE STAR AIR-ENTRAINING PORTLAND CEMENT for specific requirements in highway and various other uses.

These Cements cover the entire construction field . . . dependable performance helps build good-will for the Ready-Mix and Products Plant Operator.

*Reg. U. S. Pat. Off.

Lone Star Cement Research Laboratories have developed performance data on various concreting problems. This information is available on request to Lone Star Cement Corporation, 342 Madison Ave., New York 17, N. Y.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS. • KANSAS CITY, MO. • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25-MILLION BARRELS ANNUAL CAPACITY

ROCK PRODUCTS'
CONCRETE PRODUCTS
and Cement Products

FEBRUARY
1946

● Concrete pier at Cleveland, Ohio, which is made of precast concrete sections



Where The Eyes of the Concrete Products Industry Are Focused...

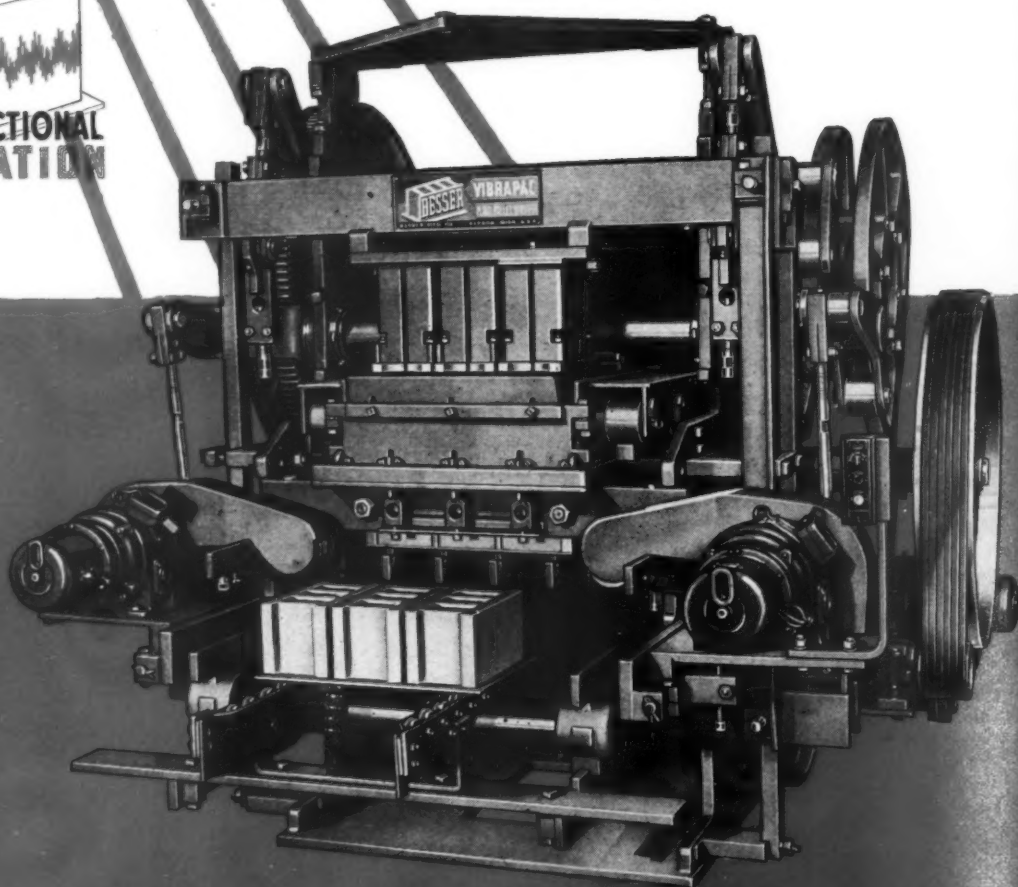


Besser Vibrapacs have been doing a big job making concrete block for government building construction throughout the United States and other countries. Wherever you go, these Vibrapac Concrete Masonry buildings stand out as a testimonial of speed and efficiency never before equalled.

Now that there is such an urgent need for private building construction, people everywhere are looking to Besser Vibrapacs as a source of the great volume of Concrete Masonry units to build millions of permanent, firesafe, beautiful and economical homes.

Besser Vibrapac concrete block plants are being geared up with the very latest production and handling devices. And new plants are being built to meet the ever-increasing demand for Vibrapac Better Concrete Masonry Units. Besser Plant Engineering Service is at your disposal for either modernizing old plants or building new ones.

**BESSER
VIBRAPAC**



**Besser
Super Automatic
Plain Pallet Vibrapac**
Capacity 600 — 8"x8"x16"
concrete block per hour. Pro-
duces 3 block at a time on
one plain pallet. Smaller
units can be made in larger
multiples on the same pallets.

IMPORTANT PATENT NOTICE — Licensed under the Gellman basic vibration patents. Undirectional vibration licensed under Flam patents. The Vibrapac combines vibration with exclusive patented Besser Plain Pallet principle.

BESSER

**PLAIN
PALLET**

The Trend of the Building Industry

-Is Toward Even More Concrete Masonry

Success and satisfaction have consistently followed architects and builders who have built well with Besser Vibrapac Better Concrete Masonry Units. Large numbers of the country's most outstanding homes, churches and schools, as well as hotels, public and commercial buildings, are convincing proof of the great **VERSATILITY** and **BEAUTY** of this most modern building material.

The manufacture and sale of Besser Vibrapac Better Concrete Masonry Units is just entering an era of tremendous expansion and substantial growth. This will mean much for those who see the possibilities — **NOW!** Besser concrete products plant engineers are ready at your call, any time, to give definite help in this expansion program. Write for further particulars.

BESSER MANUFACTURING COMPANY

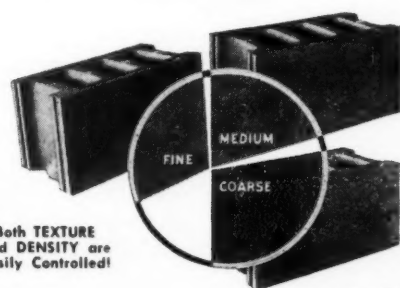
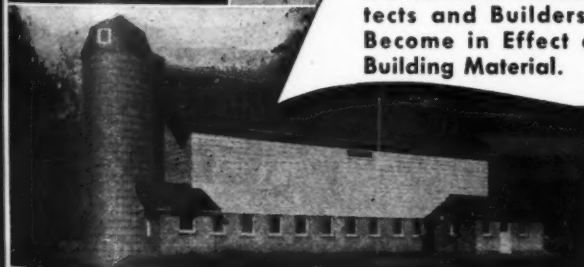
212 45th STREET, ALPENA, MICHIGAN

Complete Equipment for Concrete Products Plants

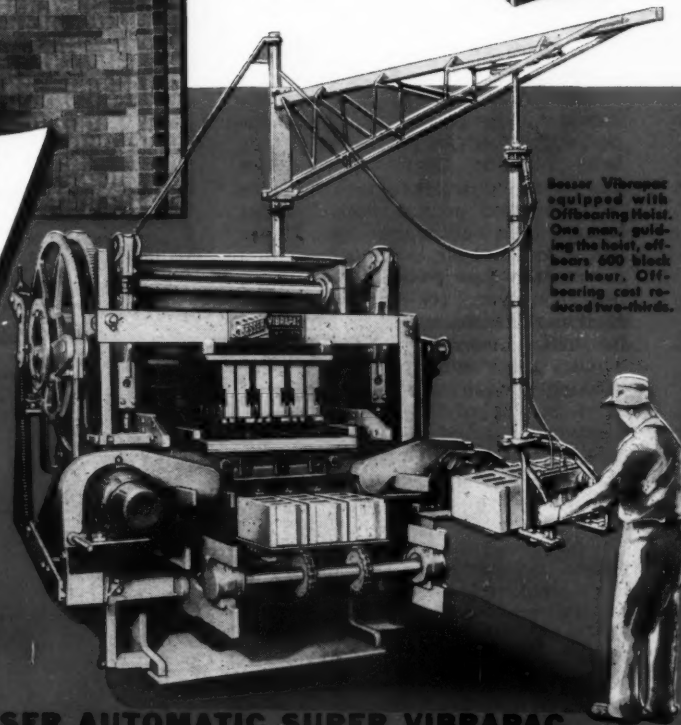
BEAUTY THAT STANDS OUT
FULLY PRESSED TOP
QUALITY THAT STANDS UP



BESSER Vibrapac BETTER Concrete Masonry Units in the Hands of Skilled Architects and Builders Have Become in Effect a New Building Material.



Both **TEXTURE** and **DENSITY** are Easily Controlled!



Besser Vibrapac equipped with Offbearing Hoist. One man, guiding the hoist, off-bears 600 blocks per hour. Off-bearing cost reduced two-thirds.

BESSER AUTOMATIC SUPER VIBRAPAC

THE SAVING IN PALLET COST WILL PAY FOR A BESSER VIBRAPAC PLAIN PALLET STRIPPER

VIBRAPACS

Concrete Pipe

MATERIAL HANDLING Speeded Up with Conveyors

Lamar Pipe and Tile Co., Saginaw, Mich., has large curing capacity

By H. E. SWANSON

BELT CONVEYORS for transporting aggregates, cement and concrete have provided a smooth flow of materials and assisted in an efficient method of production at the Lamar Pipe and Tile Co., Saginaw, Mich. Aggregates and cement, received by rail and truck, can be sent directly to the plant, or, as in the case of the aggregates, may be diverted by pants-leg chute to another belt conveyor for movement to outside storage.

Conveyors also play an important part in the plant, since three pipe machine mixers are fed by conveyor from a centrally located weigh batcher, and overflow is returned to the mixer by other conveyors.

Long Tunnel Conveyor

Aggregates, received in bottom-discharge railroad cars or in trucks, are dumped under the tracks into a hopper, which feeds by gravity to a 24-in. belt conveyor, 25-ft. centers, for movement to another hopper, both conveyor and second hopper being located in a concrete tunnel. Under the second hopper, a pants-leg chute diverts the flow to either an 18-in. belt conveyor, 100-ft. centers, for movement to stockpiles, or to an 18-in. belt conveyor, 270-ft. centers, which goes under the stockpiles through the concrete recovery tunnel

directly to the plant. Bulk cement is carried by this latter conveyor from a receiving hopper, adjacent to the tracks, to the plant. The tunnel is 7 ft. high, 6 ft. wide, and 125 ft. long, and houses the conveyor for almost half its length. The inclined part of the conveyor feeding the plant is also enclosed, as can be seen from one of the accompanying illustrations, to prevent any loss of ce-



Unique office building advertises business

ment by high wind or inclement weather.

Aggregates sent to the belt feeding the stockpile are carried to the head end where they are discharged either directly to the stockpile by



Plant in background, showing yard end of curing rooms. Belt conveyor from aggregate storage, to the right



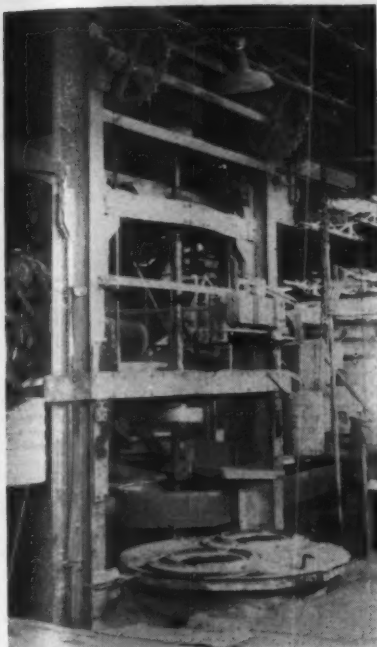
Aggregate storage with belt conveyor from railroad receiving hopper; also small belt conveyor which moves material from center of stockpile

chute or to an 18-in. belt conveyor, 20-ft. centers, for movement farther out in the stockpile area. As many as 120 carloads of aggregates can be stored in this area. The tunnel under the stockpiles has six openings through which the aggregates may be sent to the long belt conveyor for movement to the plant. Gate discharges are manually controlled.

Big Storage Capacity

Aggregates and cement carried to the plant are sent to either of five bins by means of a swivel chute. Two bins are for sand, two for gravel, and one for cement. Each bin has a capacity of 50 tons. Materials from the bins are sent by gravity to a weigh batcher set on a Toledo platform scale with a capacity of 1600 lb. The

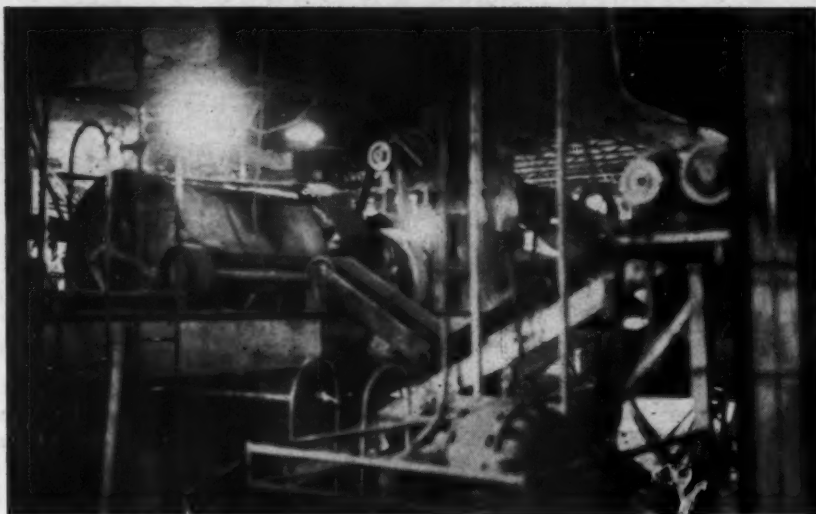
CONCRETE PIPE



One of the concrete pipe machines

batcher, set on a circular track, is centrally located between three pipe machines. Under the batcher is a 24-in. belt conveyor, 11-ft. centers, which moves with the batcher on the track. Thus, either of the three mixers feeding the machines can be accommodated. After the batch has been weighed, the movable belt feeds the concrete to a belt conveyor which takes it to the mixer serving the pipe machine. Any overflow is returned to the mixer by another belt conveyor. Therefore, in the system described, three conveyors extend from the batcher to the mixers, and three conveyors return excess concrete to the mixers.

All sizes of pipe from 6-in. through 72-in. are made on the three ma-



Mixer to the left. Belt conveyors carry concrete to machines and overflow back from machines to mixer

chines. Sizes from 6-in. through 15-in. sewer and drain tile are made on a packhead machine; sizes from 8-through 30-in. reinforced pipe are made on a small tamper; and sizes from 36-through 72-in. sewer and reinforced pipe are made on a large tamper. The larger pipe are removed to curing rooms by a 4-ton Reading overhead crane, while the smaller sizes are moved by rubber-tired buggies. In addition to the 4-ton crane, a 3-ton Reading crane is used in another section of the curing rooms for movement of heavy pipe.

There are 12 curing rooms at the plant, four are 75 ft. long, 16 ft. wide, and 9 ft. high, while eight of them are 75 ft. long, 12 ft. wide, and 9 ft. high. Low-pressure steam curing is provided by two Wicks horizontal boilers, which maintain a pressure of 10 p.s.i. in the rooms. Steam is sent through a 4-in. pipe reducing to 1½-in. pipes in the rooms, two to



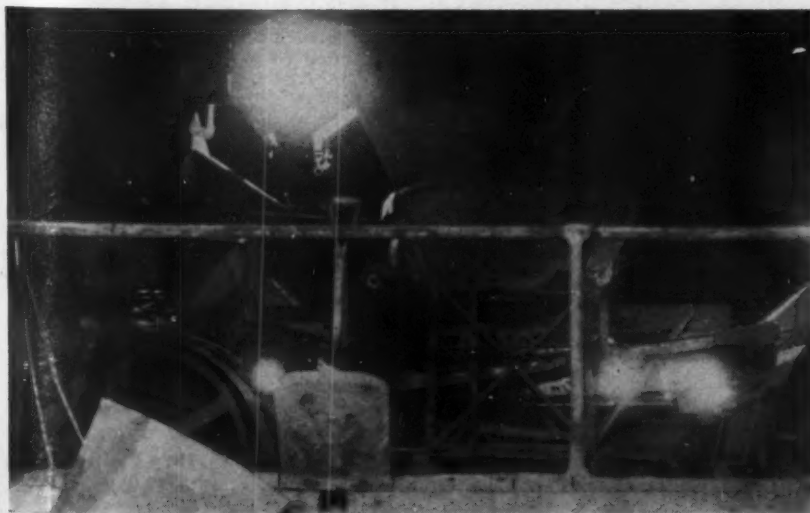
Geo. W. Holcomb, superintendent

each room. These pipes have ¼-in. openings spaced 6-ft. centers through which sufficient steam is sent to thoroughly saturate the pipe. Pipe are cured for a 12-hr. period in the summer and for 36 hr. in winter.

The large tamper can make a 4-ft., 72-in. pipe in five minutes. The table revolves about 8 r.p.m. and the tampers hit about 1800 times per minute. The packerhead can make any size except the 15-in. at one per minute.

Pipe are moved to the storage yard on trailers by two International, Model A, industrial tractors with winch attachment. Trucks are loaded from the storage yard for delivery by a ¾-cu. yd. Buckeye crane.

C. E. Edwards is president and general manager of the Lamar Pipe and Tile Co.; J. W. Corson is vice-president; George W. Holcomb is superintendent; and Herman Trautman is foreman. The Lamar Pipe and Tile Co. also operates a plant in Grand Rapids, Mich.



Mixer located centrally on platform. Movable belt conveyor feeds belt to either of three machines

Precast Specialties



Piers constructed of precast concrete members jutting out into Lake Michigan at Evanston, Ill.

Piers and Jetties of Precast Concrete

Reinforced concrete members up to two tons weight, precast piling and deck slabs were assembled into jetties to prevent shore erosion in Cleveland, Ohio, project

By S. P. LATHROP

WHAT is still a relative new use for concrete, the making of precast blocks from which permeable jetties are constructed for the purpose of stopping shore erosion and the building up of beaches, may, in time, be a very sizable use for concrete. Already a number of these new design jetties have been constructed with unusual success. One of the latest installations involved the construction of five jetties that were finished in 1945 off of Cliff Drive, Cleveland, Ohio, where shore erosion was unusually great.

Cleveland authorities had been studying the erosion problem at this location for some time, their interest increasing year by year as the problem intensified. The base of Cliff Drive is of soft shale rock and, in the period from 1939 to 1945, showed an erosion of 25 ft. As a result of this unusually rapid erosion, the entire cliff was rapidly disintegrating, so much so and so rapidly that the road running along the cliff was endangered.

When the danger became acute, several engineers and authorities were called in for consultation, among them Sydney Makepeace Wood of Lake Bluff, Ill. Mr. Wood is an erosion expert and engineer and the inventor of a new design type of jetties built of precast concrete units. His idea has been used in several other States to prevent erosion and to build up beaches. After careful consideration, the Cleveland authorities decided that the Wood idea of jetties constructed of precast concrete blocks, offered the greatest assurance of shore erosion prevention and beach upbuilding so it was decided to put in five jetties of the Wood design. A contract was let to Ralph W. Walton, Cleveland contractor, with Mr. Wood retained as consulting engineer in the construction of the jetties.

Designs of the jetties vary according to the location where they are constructed. Factors such as the depth of the water, the sand content per cubic yard of water, rate of water flow, kind and condition of the lake (or ocean floor) as well as climatic conditions all influence the design details of the jetties. The general design remains the same, however, so this Cleveland project may be taken as illustrative of the Wood design jetties.

Installation of Jetties

The floor of Lake Erie off Cleveland at Cliff Drive consists of soft shale which made the installation of the piling somewhat easier than in cases where the lake bottom is of still softer material. On the Cleveland job, the piling consisted of octagonal-shaped piles about one foot in diameter with a pedestal measuring 30 in. square by 15 in. in thickness. The overall length of the piling, naturally,

varies according to the depth of the water. On the Cleveland project the piling extends above the surface of the water about five feet, which space is taken up by precast concrete block which, together with the piling, form the jetties.

To prepare the lake floor for the jetties a clamshell bucket without teeth was used to clean off the lake floor and remove from it all loose stones and other materials that would tend to make less stable the spots where the piling would be placed and to provide a level base.

Piles were laid down in groups of four, held by templates in the same relative position they would have in the finished jetty. The templates consisted of one pair each of the cross-wise and lengthwise members which will be later described. Each group of four piles was lowered into the lake with the two pairs of precast concrete members holding each pile in each group of four in secure position until additional members could be added to build up the jetty.



Placing vertical members of precast concrete pier offshore at Cleveland, Ohio

PRECAST SPECIALTIES

Inequalities in the floor of the lake were compensated for by using "collars" of varying thicknesses. The top surface of the jetties were finished with deck slabs.

Details of Precast Units

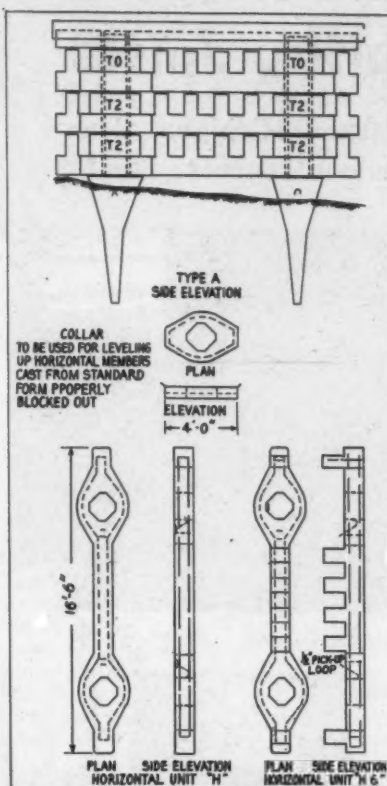
The piles, in this system, are of reinforced concrete, with four $\frac{1}{2}$ -in. steel rods running longitudinally and imbedded some two inches from the outside surface. The base is reinforced by a continuation of the longitudinal reinforcing and additional $\frac{1}{2}$ -in. steel reinforcing rods imbedded some two or three inches from the outer surface of the base.

The collars used to level off the pile elevations are of reinforced concrete in the form of the ends of the lengthwise and crosswise members. They vary from four to nine inches thick and are reinforced with a steel rod $\frac{3}{8}$ - to $\frac{1}{2}$ -in. in diameter, running around the outer edge of the collar about two inches from the edge.

The lengthwise and crosswise members are identical in shape except for length. Lengthwise members are designed on the cantilever principle. The lengthwise member is a double-eye bar, measuring 16 ft. 6 in. long, with a cantilever extending 3 ft. 3 in. from the center of the eye on each end. The crosswise members are likewise double-eye bars but without the cantilever. These members measure 12 ft. in length. Both the lengthwise and crosswise members are reinforced with not less than $\frac{1}{2}$ -in. steel rod at the top and bottom, imbedded in the concrete some two inches from the outer edge of the member. In the narrower part of these members the reinforcing is tied together with steel rods of not less than $\frac{1}{2}$ -in. diameter. The lengthwise members are one foot thick while the crosswise members are 15 in. thick at the eye and one foot thick at the web.

Lugs are cast on to some members to slow the littoral currents and aid in depositing the sand carried by the water and also to slow down wave action and avoid excess stress on the jetty. The number of lugs gradually diminishes as the outer end of the jetty is approached and also as the topmost surface of the jetty is reached. The number of lugs to a member as well as the spacing between the lugs varies, this variation resulting from consideration of such factors as wave action, quantity of sand in suspension in the water and the strength of the littoral currents. On members where lugs are used, they are reinforced with $\frac{1}{4}$ - to $\frac{3}{8}$ -in. steel rods extending up into the lug from the lower surface of the member.

The other member used in the construction of the jetty is a deck slab. It is an inverted U section measuring 10-ft. long by 3-ft. 4-in. wide and 6-in. thick with the U prongs extend-



Side elevation and plan details of precast concrete pier sections

ing another six inches. The slabs are placed with the U downward, the recessed section exactly fitting over the uppermost member and the U prongs embracing the two top members, thereby keeping them in place. On the outer end of the jetty the deck slabs are bolted to the sustaining members because of increased wave and current action. The bolts are imbedded into the top lengthwise member.

The members are cast with pickup hoops to facilitate placing. The collars weigh from 300 lb. to as much as 900 lb. while the individual members weigh from one to two tons each. In making the precast concrete members high grade concrete is necessary because of the severe strain imposed on the finished jetties and the exposure to extremes in weather. The members are cast in steel forms.

The Cleveland job consists of five jetties measuring from 200 ft. to 290 ft. in length. The jetties are designed to slow the motion of the water, to allow sand in suspension to settle and reconstruct a beach.

For this Cleveland job the contractor purchased the steel forms from Consulting Engineer Wood and they were taken to Cleveland where the units were cast. In many of these jetty jobs the forms are cast in available concrete plants this procedure being followed wherever pos-

sible. When there are no available plant facilities then the forms are set up in some vacant space, usually a vacant lot adjoining the job under construction and the casting is done there. That was the procedure followed in Cleveland, partly because of convenience and also because it was not felt that available facilities would answer the purpose.

None of these jetties have been installed in salt water but Mr. Wood has carefully checked with concrete authorities as to the advisability of using concrete without additional admixtures of chemicals in salt water and has been assured that if the best mix is used there would not be any need to change it but that the same mix used for fresh water would withstand the action of the salt in salt water.

The Cleveland job is not the first of this type of jetties that have been built under Mr. Wood's supervision and using his ideas. A notable construction was made along the shore of Lake Michigan facing Northwestern at Evanston, Ill. Another installation was at what is known as Shooting Park, Sheboygan, Wis., also in Lake Michigan. Other installations have been at Racine, Wis., Alford Park, Kenosha, Wis., and at Camp Logan, Ill., to mention a few jobs.

New Block Plants

MOONEY BROS., New Castle, Penn., has modernized its concrete block plant and a new Besser vibrapac block machine has been added. The plant has a capacity of 600 block per hour, four times its previous rate.

J. T. HASTIE, formerly city manager of Pacific Grove, Calif., and Allen J. Miller, veteran of the South Pacific, have announced the formation of the Miller Concrete Co., Pacific Grove, Calif., to manufacture concrete products. Mr. Miller entered the service in 1941 and rose from warrant officer to commander in the Navy. He was featured in a recent article in the *Saturday Evening Post* which told of his experiences while he was attached to General MacArthur's staff.

Concrete Specialties Plant

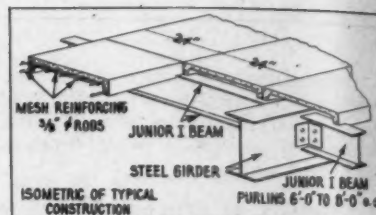
ERWEN FLOOR AND CONCRETE CO., Renton, Wash., organized by N. E. Erwen, in Skyway Park, will specialize in the production of rockeries and floors of all kinds.

Block Plant

WOODFORD CONCRETE & BLOCK WKS., Woodford, S. C., is erecting a \$10,000 concrete block plant to produce 1250 block daily. C. Moody Staley of Woodford is the owner, T. H. Livingston is business manager and Hank Lesto is production manager.

Production Line Method of Manufacturing Joists

Precast Industries, Kalamazoo, Michigan, also making channel roof slabs and concrete block



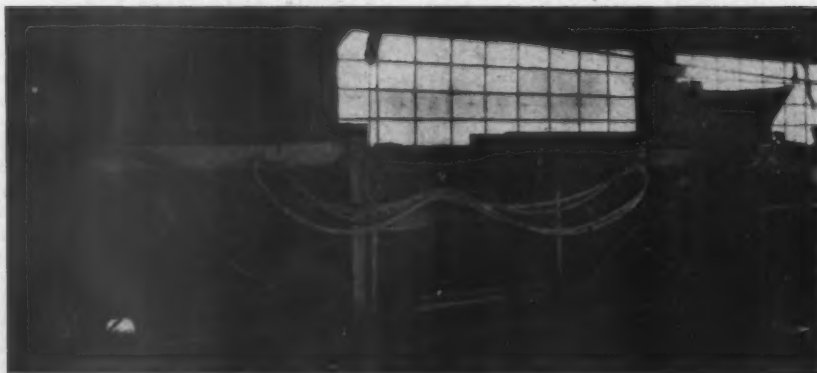
Showing how roof slabs are installed



Welding reinforcing steel for concrete joists



Showing traveling car half filled with concrete and steel reinforcing in place



Showing passage of traveling car underneath the hopper receiving the balance of the concrete in the rolling process forming the joists

A BOUT 16 years ago the first installation of the patented Lith-I-Bar process for the mass production of lightweight concrete joists was made at a plant in Kalamazoo, Mich., now known as Precast Industries. It is of interest to note that the machine is still producing joists as well and in the same quantity as it did when first installed, and promises to continue for some time to come. From time to time other products have been added so that the company now has a completely diversified line of concrete products.

Joist Manufacture

Graded Haydite aggregate is used to produce a unit which is light in weight and more easily handled. The joists contain reinforcing consisting of two steel bars, one each at the top and bottom of the unit, connected by electrically welded stirrups. The number and size of the stirrups as well as the size of the steel rods is dependent upon the size of the joist produced.

The machine is about 100 ft. long and supports a travelling carriage, or mold box, 36 ft. long, which permits the manufacture of joists up to that length. The mold box travels horizontally on the machine from one end, where it is filled with concrete and reinforcing, to the other end, where the joist is removed after passing through rolls which compress and form the joist. As the mold box is drawn to the beginning end of the machine, it is partially filled with concrete from a hopper located above and about midway along the machine. Reinforcing is placed in the mold box, which is drawn under the hopper again where it is filled to excess with concrete. As it passes under the hopper, a strike-off board levels the concrete so that the proper amount is retained as it goes under the rolls. The rolls, eight in number, form and compress the concrete in the box by exerting a pressure of 2000 p.s.i. on the joist as it passes through. As it emerges from the rolls, it is mechanically trowelled so that a smooth finish is effected. Upon reaching the farther end of the machine, the joist is removed by an overhead crane and placed on finishing tables. Here hand trowelling completes the job and the joist is ready to be placed on racks for steam curing.

The machine makes joists from 6 in. through 14 in. in width and up to 36 ft. in length. An average of

3600 ft. can be produced per day, and a 14-in. joist can be made in about eight minutes.

Reinforcing cages are fabricated to the size and length desired by a Lincoln arc welder. Haydite lightweight aggregate is received by truck and stored in three silo bins with about one-car capacity each, by bucket elevator. Discharge from the bins is to a weigh batcher, then to a 20-cu. ft. Besser mixer, mounted on wheels and self-propelled for movement from the batcher to the hopper above the joist machine.

After the finished joist has been placed on racks by a 1-ton Sprague overhead crane, they are covered with a demountable kiln, consisting of a framework covered with Masonite wallboard. Steam is introduced into the kiln at 15 p.s.i. where the joists are cured overnight. A temperature of 100 deg. F. is maintained during the curing period. After curing, they are lifted from the racks by the crane and placed in an adjoining room where a 750-lb. Budgit hoist, operating on a circular overhead track, picks them up and places them on trucks for movement to the storage yard.

The Lith-I-Bar process of joist manufacture is installed in plants on a license basis and this company



Illustrating method of stripping joists from car

is the sole producer for the State of Michigan.

Make Brick, Block and Roof Slabs

In addition to the manufacture of joists, concrete masonry units are also produced. Lightweight aggregates discharge from the silo bins to the weigh batcher which discharges directly into a 20-cu. ft. Stearns mixer. Bottom-discharge from the mixer is to a paddle-flight drag conveyor which moves concrete to a hopper above an Anchor tamper block machine. Finished block are placed on racks and moved to steam curing rooms by Barrett-Craven lift trucks. Four rooms are available for curing block, with a total capacity of 3600

standard units, where overnight curing is done.

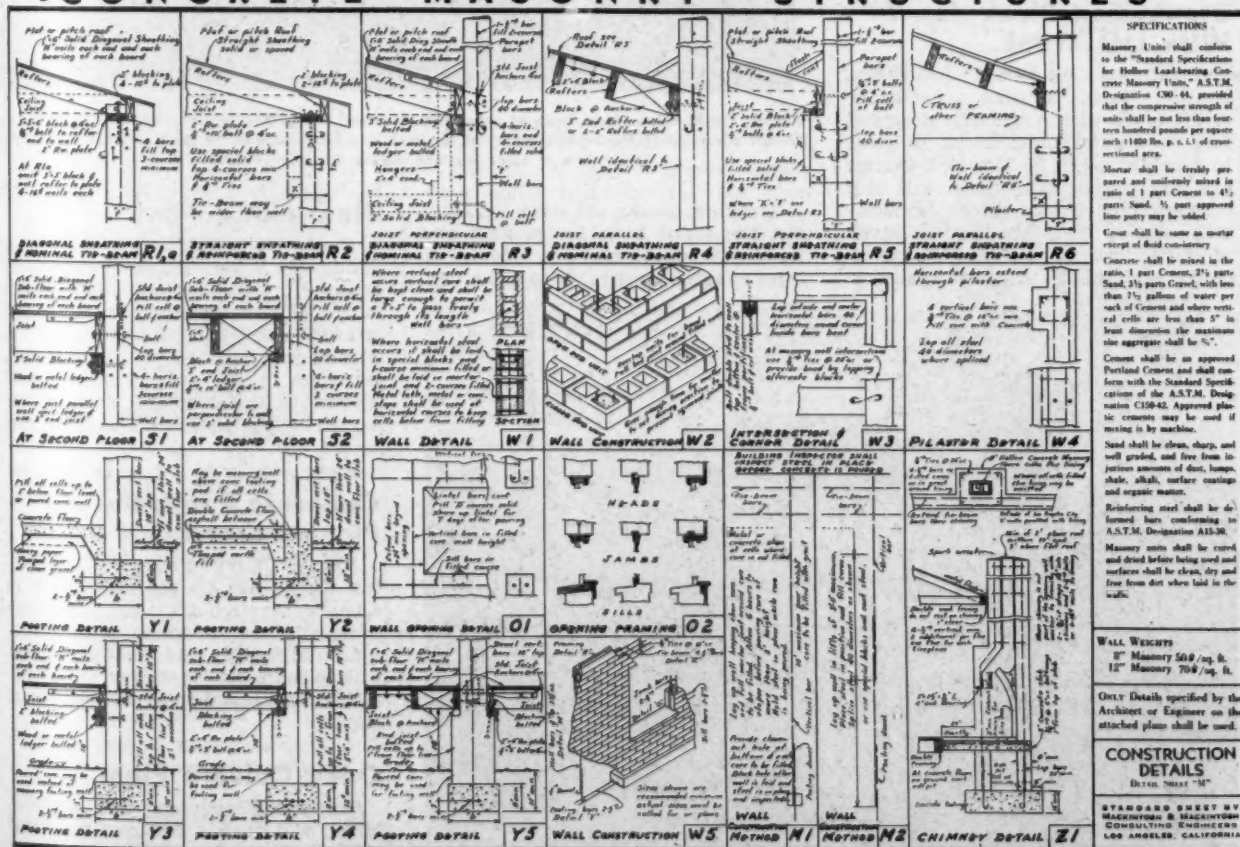
Joist manufacture is the main line of production, with Channelcrete precast roof slabs second. In addition to these products, concrete brick, made on a Dunbrik machine, and some specialty items are also made.

Charles V. Berry is the general manager of Precast Industries.

Veterans' Block Plant

RENCRETE PRODUCTS CORP., Renton, Wash., is producing concrete masonry units and allied products in a plant just outside the city limits. Operators of the concern are Paul Shorett and Robert A. Elliott, both recently released from the Army Air Transport Command.

CONCRETE MASONRY STRUCTURES



Instruction sheet distributed by California concrete products manufacturers to show approved methods of construction with concrete block

Build Combination Ready Mix and Block Plant

SAGER CONCRETE PRODUCTS CO., Jackson, Mich., is now in the process of building a combination ready mixed concrete and masonry unit plant. The plant will have complete gravity flow, from the dumping of raw materials into the bins to the finished product. It is located against the side of a hill and a ramp has been constructed which permits trucks to dump into the bins located above a weigh batcher. Materials from the weigh batcher can be sent through a pants-leg chute to either transit mixers or to the mixer above the block machine. The entire plant is 40-ft. high and the operations will be as simple and economical as possible. Included are Blaw-Knox 4-compartment bins, a Blaw-Knox bulk cement system, a 28-cu. ft. Stearns mixer, and a new Stearns Joltcrete. Steam curing kilns are to be built outside of the main building as soon as possible. The plant should be in operation by early Spring of this year.

Produce Silo Staves

C. E. SPAAN and H. J. VAN DYK, Lynden, Wash., are now operating the Northwest Concrete Products Co. This new plant will make concrete block and concrete silo staves.

Stockpiling Block With Lift Truck

GRAYSTONE CONCRETE PRODUCTS CO., Seattle, Wash., is using a carloader or lift truck with a specially designed fork to tier concrete block in rows to a height of 15 ft. The fork prongs are so spaced that each will slip through four blocks placed horizontally end to end. The bottom layer of each load thus functions as a pallet, saving both time and space.



Stockpiling concrete block with lift truck



Above: Trucks unload from ramp at upper left into bins. Weigh batcher in same building dumps to transit mixers or to block plant mixer. Block plant is in large building to the right. Below: Installation view of block machine, Sager Concrete Products Co.

The fork trucks are used throughout the plant both for moving and loading products, and are reported to have effected savings up to \$25 a day.

New Block Plant

SUPER CONCRETE BLOCK CO., Richland, Ga., has started operations making both heavy and light weight block. Aggregates used are sand and gravel, slag, and Superock. J. S. Hendricks, Jr., and J. D. Eldredge, partners in the enterprise, are well known to the concrete block industry in which they were active prior to the war.

Concrete Products Plant Opened

BAXTER CEMENT PRODUCTS CO., Baxter, Kans., has started production in a new concrete block plant. The company will be a subsidiary of the Blosser Building Co., and the block plant will be managed by Harry Wells, recently discharged from the merchant marine.

Open Culvert Plant

SUPERIOR PRODUCTS CO., Detroit, Mich., will open a concrete pipe and culvert plant near Wells, Mich., as soon as equipment can be obtained.

A SCOOP

in the Rock Products Field!

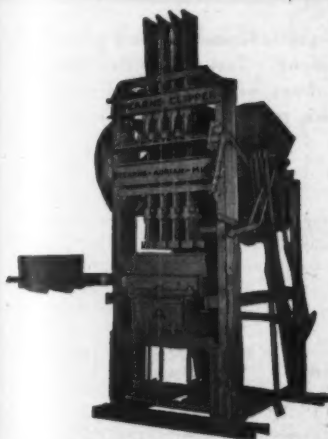
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Anchor Concrete Mch. Co.

G. M. Friel, Mgr. Columbus 8, Ohio

Sell Block Concern

BLUFFTON CEMENT BLOCK CO., Bluffton, Ohio, has been sold by Lloyd Murray and Henry Balmer to Ben Amstutz. Mr. Amstutz plans to operate the plant in association with his two sons who recently returned from the service.

Concrete and Scoria Block

CONCRETE and scoria block as well as concrete stepping stones are now being produced in Snohomish, Wash., by Freeman Lancaster.

Add Bulk Facilities

HAY-CON-TILE CO., Detroit, Mich., manufacturer of concrete units, will install a bulk cement arrangement to be in operation by next year.

Products Plant Sold

RENTON CONCRETE PRODUCTS, Renton, Wash., formerly owned by C. R. Hudson, has been sold to Paul Shorett who will continue to operate the business.

Make Concrete Block

C. R. OLSON, El Dorado, Ark., is principal owner of a new concrete block plant in El Dorado. The plant, known as Concrete Products Co., has just gone into operation.

Hot Mix Paving

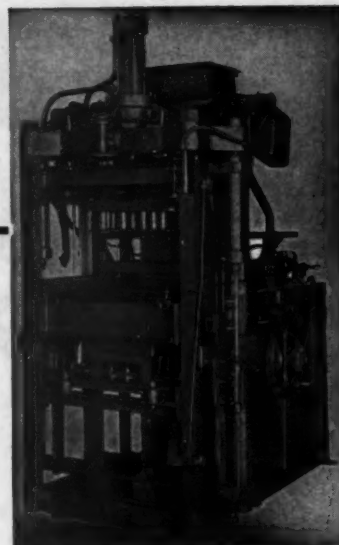
THE ASPHALT INSTITUTE, New York, N. Y., has published a manual which defines standard, hot mix design and application, method of laying and inspection and test procedures.

Map Barite Deposit

TUCKER HOLLOW BARITE MINE, Cartersville District, Ga., has been mapped by the Geological Survey in an effort to discover new barite deposits and to evaluate known deposits in Georgia. A geologic and topographic map of this mine is filed in the offices of the Geological Survey in Washington, D. C., and Cartersville, Ga., and in the office of Capt. Garland Peyton, Director, Department of Mines, Mining and Geology, Atlanta, Ga.

Lime Shipments Up

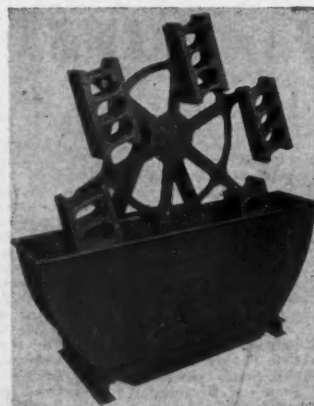
Ratio of lime shipments to capacity of plants has shown an increase for November, 1945, as compared with November 1944. Latest available data from the National Lime Association show these ratios to be 62.5 percent and 60.2 percent, respectively. Of this increased production, 90,586 tons were shipped as quicklime and 49,543 tons as hydrate. Quicklime distribution was 1473 tons for agriculture, 7687 for building and 81,426 for chemical use. Of the hydrated lime produced, 6029 tons went for agriculture, 21,992 for building and 21,522 for chemical use.



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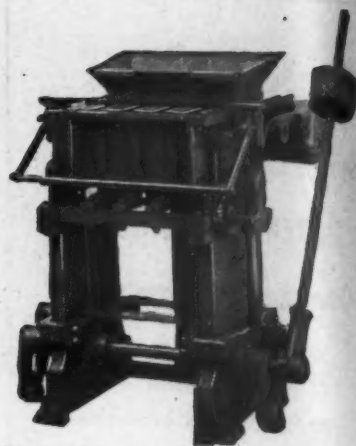
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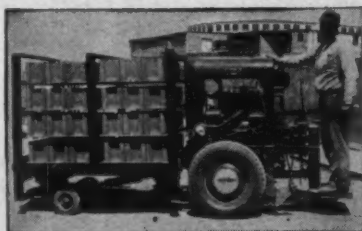
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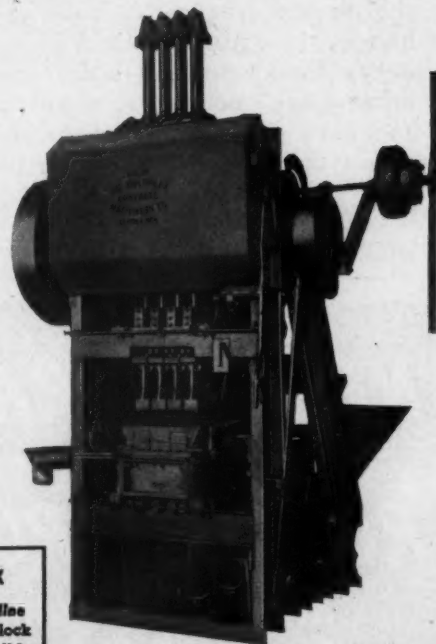
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MULTIPLEX SUPER-TAMPER

• Consistently builds high-quality brick, tile or block at the rate of 4 to 6 units per minute from any aggregate. Many manufacturers have made a lasting reputation with the Multiplex Super-Tamper.

• Engineered for simple operation and trouble-free service. Has 8-bar tampers, positioned-timed feeding, and stripping, 5-point action clutches.

• Built for a lifetime of rugged wear with all-steel welded frame, reinforced mold box.

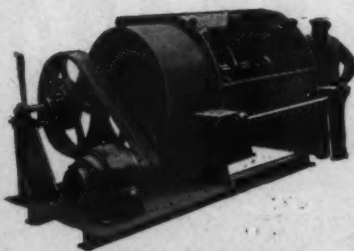


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A Profitable Side-line
Multiplex Flue Block machine makes solids of lightweight units with attachments for ventilator and stove-pipe openings. Simple and profitable to operate.

MULTIPLEX MULTI-MIXER

with reverse screw-type action insures fast and thorough mixing of every batch. This is the machine for an "assembly line" uniform product at all times.



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MACHINERY

ELMORE, OHIO



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Wearers of the service emblem, you have proved to the world that Americans with American-made machines could not be defeated. Many of you have used LIMA cranes, shovels and draglines to build air strips and bridges; to load and unload ships; to remove debris from bombed areas and countless other jobs important in winning the war. You have seen the efficiency of LIMA machines under trying conditions, how their

smoothness of operation, ease of control and fast operating speeds step up the tempo of the job. To the veterans, who will continue to serve America in peacetime operations, LIMA offers the same high quality shovels, cranes and draglines which served so well in war. LIMA shovels are made in sizes ranging from $\frac{3}{4}$ yard to 5 yards capacity, crane sizes range from 13 tons to 100 tons. Write for bulletins.

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all widths and plys

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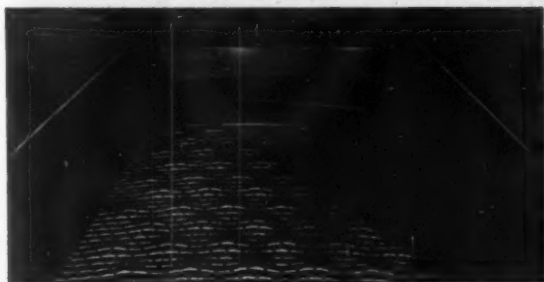


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HI-DUMP,
2, 3, 4 1/2 yd. sizes.
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2 to 8 yd. sizes.



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JAEGER offers the only complete modern line...

Sealed Drum Top-Loaders are specially recommended for wet-mix concrete and also highly efficient for any type plant. One-shot top loading is the fastest method and insures proper distribution of the materials plus void space needed for a fast, thorough mix. Sealed drum holds heat in winter, protects concrete from bad weather and, in combination with "Slow" mixing through Jaeger's 2-speed transmission, maintains predetermined slump on long hauls. Lighter weight and ease of maintenance are also advantages of this type.

Jaeger End Loaders with exclusive Gated Hopper are the fastest charging and discharging end-loaders on the market.

ALL HI-DUMP Speed Merchants offer these exclusive Jaeger improvements:

- Water Tank on Main Frame — for more accurate measurement and lowest center of gravity.
- High Pressure, Positively Clog-Proof Jet — an outstanding improvement in water distribution in hi-discharge truck mixers.
- Streamlined Enclosed Front End for all-weather protection and winter warmth.
- Transmission and Center Drive in Lifetime Alignment.

For these and many other advanced features ask for new Catalog TM-5.

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OR CAUSE TIME OUT**

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for Slurries, Sand Tailings, Slimes, Acid Sludges

Save Pumping Cost

Continuous operation without attention for long periods. Stuffing box, stuffing gland water ALL eliminated. Close clearances maintained by easy slippage seal adjustment. Heavy pumping parts of material best suited for YOUR particular problem. Complete engineering service. Prompt shipment of parts. The most efficient and economical pump you can buy. Write for Complete Catalog.

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with Hopper Removed

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Any size or style screen, in thickness of steel wanted with any size perforation desired.

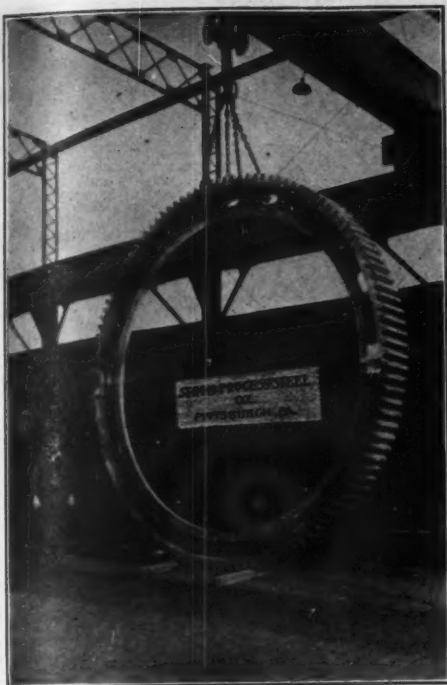
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TRADE MARK
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A Strohm master gear for a 10' kiln, one of many installed on tube mills, kilns, crushers, coolers, and other machinery.

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20 DEGREE CAST TEETH
LONG AND SHORT ADDENDUM

In the two characteristics most important to efficient power transmission Strohm has developed refinements that result in fewer replacements, smoother operations, and longer wear of gear drives.

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The 20 degree involute long and short addendum gearing offers the following advantages: 20 degree teeth are much stronger than 14½ or 15 degree teeth, two teeth come into contact earlier and stay in contact longer, wear longer, chatter less, require less power to operate and have other advantages.

Write today for our catalog describing fully the Strohm Process 20 Degree Gear Teeth.

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UNIT 514 SPEEDS UP THE JOB!

Compact, ½ yard excavator. Exclusive UNIT features include: FULL VISION CAB . . . Finger-tip controls . . . Automatic foolproof traction brakes . . . Drop-forged alloy steel gears . . . One-piece cast gear cast. Convertible to all attachments.



½ YD.

UNIT 514 — ½ Yard Shovel

UNIT 514
5 Ton Crane



UNIT 514
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Made in various standard sizes—single or multiple decks, with or without enclosures.



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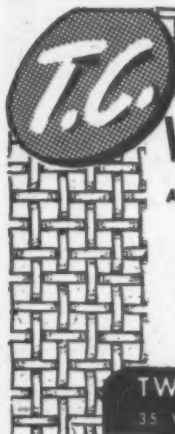
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ACCURATE • DURABLE • ECONOMICAL

The reliability of T.C. Alloy Screens has carried them into all parts of the world. Made in Standard and Special Weaves, with Square or Oblong Openings—from 10 mesh, .035" wire on up. Write today for Catalog No. 42.

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Prompt Delivery ON BOTH STANDARD TYPES

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GEAR AND WHEEL PULLERS

Essential Tools Prompt Shipment because they save hours of time, prevent costly breakage and long shut-downs.

STEELGRIP Standard Rigid Arm Gear and Wheel Pullers are of improved design. Will not slip from work. Arms are forged and heat treated. 2-arm, 3-arm and special designs. 34 types and sizes.

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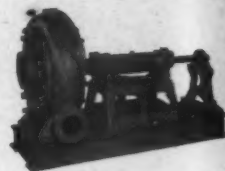
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Complete stock of replacement parts, elbows and fittings carried for prompt shipment.

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Stop losses! Write today.

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The machine that made LIME popular!



Patented
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View of a 6½ ton load in a 11-foot body.

View of our heavy, cut steel and bronze, 15 to 1, Gear Reduction. All gears are straddle mounted between Timken tapered roller bearings, sealed against dirt and running in a bath of oil. Simple, efficient, trouble-free — will give years of service.

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Here is the all-around machine you have been waiting for — put it on your truck and use it the "whole year 'round." Spreading lime is only one of the many jobs this model will do!

MODEL K Wide Throat Drag Chain Type

Steel Body and Undercarriage. Capacities, 5 to 15 tons. Made in 9, 11, 13, 15 and 17 lengths — and 19, 21, 23 and 25 foot lengths with sideboards.

Handles wet or dry lime. Timken straddle mounted bearings, ball and roller bearings throughout. Only two oil-sealed cases and 1 short roller chain drive. Automatic chain feed regulator. Automatic endgates — large endgate for fast dumping. New style automatic drag chain tightener with anti-wrap chain stop. Only 1 patented distributor used. Spreads from 35 to 45 feet depending upon truck speed.

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Motor or Farm Tractor Drive Spreader
Model F, Flat Bed Type Spreader
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Model M, Car Unloader

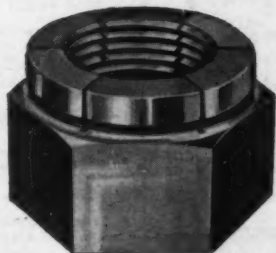
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- ✓ It is of one-piece construction
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Sizes from #6 to 1" in diameter; millions in use. Write for Bulletin 582.

The famous "Unbrako" Socket Screw Products are also made by us.



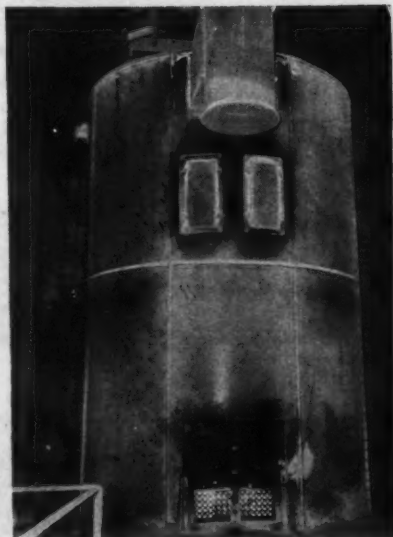
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Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. 1,000 cu. ft.

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- 1-No. 3 Champion jaw crusher, size 7½x13"
- 1-United Iron Works, "Blake-type" jaw crusher, size 9½x24"
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- 4-Steel guy derricks, 1-30 ton Insley 115' mast, 100' boom. 2-30 ton American steel guy derricks, 1-110' mast, 110' boom. 1-100' mast, 90' boom. 1-15 ton American steel derrick, 53' mast, 70' boom. 1-5 ton Terry Guy Derrick, 70' mast, 60' boom.
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and single drum, with AC or DC motors, some with attached swingers. Following makes: American, Clyde, Lambert, Lidsgerwood and National.

Gas hoists ranging from 8 to 150 H.P., single double and triple-drum; all standard makes (38 in stock).

Steam, ranging from 8 H.P. to 60 H.P., single, double and triple-drum; all standard makes.

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- 4-Model 17 Denver rock drills.
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- 5-Jackhammers, consisting of Hardsoco, Worthington and Cleveland. 45 lb. and 55 lb. class.
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Including—

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16,000' of Belt Remaining With Idlers, Pulleys, and Drives

ALSO—

Electric Motors, Line Equipment, Transformers and Supplies

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- 1-80 ton Baldwin 0-6-0 separate tender switcher, built 1925. A.S.M.E. boiler, piston valves, Walschaerts valve gear, overhauled and up to date on all I.C.C. requirements.

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- 1-30 ton Whitcomb diesel-Mechanical 38" gauge locomotive, four wheel type.

- 2-30 ton gasoline locomotives, 4 wheel type, built 1941 and 1942, overhauled, standard gauge.

- 1-American Eagle track crane, gasoline drive 7½ ton capacity.

Birmingham Rail & Locomotive Co.
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Immediate Delivery

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- 80 Ton American Locomotive 0-6-0.
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- 1 Super K Besser Machine
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- 60 Chase Cars
- 3500 or more plain steel pallets
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MANKATO, MINNESOTA

FOR IMMEDIATE DELIVERY OF RUBBER PRODUCTS

Conveyor Belting...Transmission Belting...Elevator Belting...Fire, Water, Air, Steam, Suction or Welding Hose, etc.

CALL, WIRE or WRITE
CARLYLE
THE
RUBBER HEADQUARTERS

CARLYLE RUBBER PRODUCTS ARE
NEW, GUARANTEED & LOW PRICED

CONVEYOR BELTING

ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers	Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"	20"	5	1/8"	1/32"
42"	5	1/8"	1/16"	20"	4	1/8"	1/32"
36"	6	1/8"	1/16"	18"	4	1/8"	1/32"
30"	6	1/8"	1/16"	16"	4	1/8"	1/32"
30"	5	1/8"	1/16"	14"	4	1/16"	1/32"
24"	5	1/8"	1/32"	12"	4	1/16"	1/32"
24"	4	1/8"	1/32"				

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

Inquire For Prices - Mention Size and Lengths

ENDLESS "V" BELTS

"A" WIDTH All Sizes | "D" WIDTH All Sizes
"B" WIDTH All Sizes | "E" WIDTH All Sizes
"C" WIDTH All Sizes | Sold in Matched Sets
Inquire For Prices - Mention Size and Lengths

PROTECT THAT PLANT

FIRE HOSE

APPROVED SPECIFICATION HOSE EACH LENGTH WITH COUPLINGS ATTACHED

Size	Length	Per Length
2 1/2"	50 feet	\$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1 1/2"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

SPECIAL OFFER... HEAVY DUTY RUBBER HOSE

Each Length with Couplings Attached	Length	per Length
3/4"	25 feet	\$4.25
	50 "	8.00
1"	25 "	6.25
	50 "	12.00
1 1/4"	25 "	7.50
	35 "	10.50
	40 "	12.00
1 1/2"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

I.D. Size	Length	per Length	Couplings
1/2"	25 feet	\$5.00	\$1.50 Pair
	50 "	10.00	1.50 "
3/4"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
	50 "	20.00	3.50 "

LARGER SIZES ALSO AVAILABLE
All Prices—Net—F.O.B. New York

CARLYLE RUBBER CO., INC.

62-66 PARK PLACE

NEW YORK, N. Y.

FOR SALE

One new 48"x10' Jeffrey-Traylor vibrating feeder. Operates on 440 V., 60 C., 1 P. Generator. For full particulars, contact

BASIC REFRACTORIES, INC.
MAPLE GROVE, OHIO

FOR SALE

Ford Thornton Tandem with 8 yd. dump bed—825 x 20 tires—perfect condition in every way. This was built up in June, 1945.

JOE BOUGHTON
Tel. CO. 2590—R. R. 17, Box 490
INDIANAPOLIS, IND.

FOR SALE

- 50" x 24" Champion Jaw Crusher
- 36" x 24" Farrel Jaw Crusher
- 36" x 15" Farrel Jaw Crusher
- 28" x 14" Universal Jaw Crusher
- 36" x 6" Farrel Jaw Reduction Crusher
- 26" x 15" Farrel Double Roll Crusher
- 21" x 40" Pennsylvania Single Roll Crusher
- 21" x 36" McLanahan Single Roll Crusher
- Barber-Greene Model 82-A Bucket Loader
- 12' x 4' TelSmith Double Deck Vibrator Screen
- 12' x 3' Symons Double Deck Vibrator Screen
- 18' x 3' Acme Trunnion Drive Revolving Screen
- 30' x 18" Bucket Elevator Rex Chain
- 46' x 16" Bucket Elevator Link Belt Chain
- 66' x 30" Bucket Elevator 12-Ply Belt
- 150' Center 30" Belt Conveyor Complete with Speed Reducer
- 136' Center 24" Belt Conveyor Complete with Speed Reducer
- 106' Center 18" Belt Conveyor Complete with Speed Reducer
- 75' Center 18" Belt Conveyor Complete with Speed Reducer
- 45' Center 18" Belt Conveyor Complete with Gear Reduction.

FRANK A. KREMSER & SONS, INC.
3434-45 North 5th St., PHILADELPHIA 40, PA.
Office Phone REGENT 7272 — Night Phone 7059

- 1—20-ton WHITCOMB 36" Ga. Diesel Locomotive—rebuilt.
- 1—32-ton WHITCOMB Standard Ga. Gasoline Locomotive.
- 1—78-ton BALDWIN Type 0-6-0 Standard Ga. Side Tank Locomotive—new 1923—rebuilt.
- 1—80-ton BALDWIN Type 0-6-0 Standard Ga. with separate tender—rebuilt.
- 1—20-yd. WESTERN Air Dump Car, Vertical Cylinders—reconditioned.
- 2—2200 and 3300 cu. ft. Chicago Pneumatic stationary Air Compressors—400 & 500 H.P. Synchronous motors.
- 2—25 & 40 ton American Diesel Locomotive Cranes.

B. M. WEISS COMPANY
Girard Trust Company Building
PHILADELPHIA 2, PA.

GENERATOR SET

Crocker Wheeler Company Style Z-51 Type —C.M. 230 Vt. 127 Amp. V-Belt driven with 40 H.P. 220 Vt. 3 phase 60 cycle Allis Chalmers induction motor.

HAYES QUARRIES

338 Railway Exchange Bldg.
Kansas City 8, Mo.

FOR SALE

- 1—60 cu. ft. Portland Concrete Mixer for Block Plant without motor.
- 797 Used Plain Steel Pallets — 18" x 13" x 9/32".

VOLZ FIRE CLAY COMPANY

P. O. Box 228, Clayton Station
St. Louis 5, Missouri

FOR SALE

2—315 cu. ft. 1000 lb. pres. Ingersoll-Rand. Models 315 and 315A portable Air Compressors with 105 HP Waukesha Oil Engines, complete with accessories.

SLIPRING MOTORS

QUA.	HP	MAKE	VOLTS	RPM	TYPE
1	700	G.E.	2200	393	MT-432
1	280	Burke	440	600	EMV-65
1	75	G.E.	220/440	1200	I
2	60	West.	220	1800	CW
1	50	West.	220/440	1120	HF
1	50	Chandeysson	220/440	1800	MT

DUQUESNE ELECTRIC & MFG. CO.

6428 Hamilton Avenue

Pittsburgh, Pa.

HERE TODAY?

PORTABLE DIESEL GENERATOR SETS



INTERNATIONAL UD-14-UD-18
BRAND NEW—SPOT DELIVERY
RADIATOR COOLED—SKID MOUNTED
FULLY ENCLOSED
60 CYCLE 127/220 VOLT
50 CYCLE 230/400 VOLT

BARGAIN

ROBERT SCHOONMAKER

Port Washington, Long Island, N. Y.
Phone BRIDGE 12320

ALL READY FOR WORK

P & H Model 400 Crawler Gas Shovel, 3/4 yd. Completely overhauled, first class condition.
Brownhoist Crawler Gas Crane and Dragline, 35 ft. boom, 3/4 yd. capacity.
Northwest Crawler Gas Crane, 40 ft. boom, 1 yd. capacity.
Nelson Crawler Gas Spiral Feed Bucket Loader.
Barber-Greene Model 42 Gas Disc Type. Bucket Loader on pneumatic tired wheels.
85 H.P. Horizontal Self Contained Boiler, 175 lbs., ASME inspection guaranteed.
Complete selection of parts Erie Type B. Crawler Steam Machine and Caterpillar 60 Gas Tractor.
Low prices for quick sale.

THE ACME EQUIPMENT COMPANY
14057 Schaefer Highway
DETROIT 27, MICHIGAN

WHAT'S ON YOUR MIND?

Want to SELL—BUY something!

You can do either quickly and at low cost by advertising in ROCK PRODUCTS' Classified Advertising Section. You get quick results. Rates are low—\$5 per column inch (larger insertions accepted at lower rates).

SELL IT THROUGH

ROCK PRODUCTS CLASSIFIED

FOR SALE

BUCKET ELEVATOR—70 foot complete with 24 inch Buckets and near new, 26 inch Heavy Ply Belt, \$750.00.

HAYES QUARRIES

338 Railway Exchange Bldg.
KANSAS CITY 6, MO.

FOR SALE

Howe 20 ton platform scale in excellent condition. Priced right. Also, some good concrete block making machinery.

WM. M. CHASE

15 Linwood Avenue Buffalo 2, N. Y.

POSITIONS WANTED

CONCRETE, aggregates, soil-stabilization, physical test-engineer, ten years' experience, college graduate. Position desired in Southern California. Write Box D-35, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

POSITIONS VACANT

WANTED—ENGINEER

Eastern Portland cement manufacturer desires resourceful and aggressive young engineer with mechanical or civil engineering training for plant layout, construction, and maintenance. Applications from veterans preferred. In reply state complete information in regard to education, experience, and personal information to Box D-34, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

EQUIPMENT WANTED

WANTED:

A complete central Mix Concrete Plant or component parts —3 or 4 compartments, 150 yd. minimum capacity; 3 yd. Batchers and Automatic Scale; 600 bbl. minimum Cement Bins with under track screw and elevator; Mixer.

Describe fully: make, model, age, condition, location and price. Caruth Building Service, Rt. 7, Bx 238, Dallas 6, Texas.

WANT TO BUY

24"x36" Butterworth and Lowe Jaw Crusher or other lightweight Jaw type 20" to 24"x36" or Single Roll Stone Crusher 24" to 30"x36". Give full details and price.

Write Box D-36, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE

AIR COMPRESSORS

BELTED: 355, 525, 676, 1000, 1300 & 1570 Ft. ELECTRIC: 475, 576, 807, 1300, 1725 & 2200 Ft. DIESEL: 505, 807 & 1000 Ft.
PORTABLE GAS: 110, 100, 230, 310, 540 & 1300 Ft. STEAM: 40, 310, 525, 1300, 2200 & 3000 Ft.

CLAMSHELL BUCKETS, SKIPS & GRAPPLES
Owen R & H Stone Grapples.
3 Yd. OWEN Type S Material Handling.
1 1/2 Yd. 1 Yd. & 3/4 Yd. HAYWARD Class E.
18 Steel Skips 6 1/2 x 6 x 2 1/2.
5 Ton Bucyrus Rock Grabs.

CRANES AND DRAGLINES

1-16 Yd. 100' Boom Electric Caterpillar Drag-line.
1/2 Yd. 5 Ton O & S 30 Ft. Boom.
13 Ton NORTHWEST 50 Ft. Boom Gas.
20 Ton LIMA 750 Diesel, 65 Ft. Boom.
25 Ton BROWNING & 30 Ton AMERICAN Loco.
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom.

CATERPILLAR SHOVELS

2 Yd. Marion Steam Shovel.
4 Yd. 1 1/2 Yd. 2 Yd. & 4 Yd. MARION Electric.
1 Yd. NORTHWEST Gas.
1 1/2 Yd. LIMA Diesel.
1 1/2 Yd. Bucyrus 41B Steamer.
4 Yd. Bucyrus 120B Electric. Also 3 yd. Erie Elec.
5 Yd. P & H Model 1500 Elec.

DUMP CARS

46-KOPPEL 1 1/2 Yd. 24 & 30 In. Ga. V Shaped.
15-2 Yd., 3 Yd., 4 Yd., 6 Yd., 12 Yd., 36 In. Ga.
20 Ton BROWNING & 30 Ton AMERICAN Loco.
15-Std. Ga. 50 Ton Battleship Gondolas

BOX, FLAT & TANK CARS

9-50 ton std. ga. heavy duty flat cars.
30-3000 gal. cap. tank cars.
30-40 ton std. ga. box cars.

HOISTING ENGINES

Gas: 15, 30, 60, 100 & 120 HP.
Electric: 30, 55, 80, 100 & 150 HP.
Steam: 6 1/2 x 8, 7 x 10, 8 1/2 x 10, 10 x 12, 12 x 24.

DIESEL UNITS

75, 90, 180, 200 HP. F. M. Engines.
175 KVA Worthington 3/60/2300.
275 KVA Fairbanks 3/60/2300.
345 KVA Fairbanks-More 3/60/480 V.

BALL, ROD AND TUBE MILLS

5'x22" HARDINGE CON. Dry Ball Mill.
6'x22" HARDINGE CONICAL Pebble Mill.
6'x22" HARDINGE CONICAL Ball or Pebble Mill.
4'x8, 8'x8 & 10'x8 Straight Ball Mills.
4'x16, 5'x18 & 6'x22 Tube Mills 6'x22".
3 1/2'x8 & 5'x7 Air Swept Tube Mills.
2 1/2'x8, 6'x12 & 8'x12 ROD MILLS.

PULVERIZERS

JEFFREY 24x20 & No. 1 Sturtevant Ring Roll.
RAYMOND Auto Pulverizer No. 0000, 0 & 3.

STEEL STORAGE TANKS

10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

SEPARATORS AND COLLECTORS

8, 10 and 14 ft. Separators, Gateco & Bradley.

ROLL CRUSHERS

36x60 Fairmont & 36x20 Diamond.

JAW CRUSHERS

10x8, 13x7 1/2, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 20x13, 30x15, 30x13, 36x15, 36x30, 36x18, 36x14, 36x9, 36x6, 36x10, 36x24, 42x9, 48x24, 48x36, 60x43, 84x66, 84x10, 9x36.

CONE & GYRATORY CRUSHERS

5 No. 10, 25, 37 & 40 Kennedy.
18 in. 24 in. 30 in. 36 in. & 48 in. Symons Disc.
4-10 T2 Traylor 4 ft. Gyratory.
4-Nos. 5, 2 & 6 Austin Gyratory.
2-Traylor T-12 Bulldog Gyratory, also 16 inch 8 in. Traylor T. Gyratory.
17 Gates K-Nos. 3, 4, 5, 6, 7 1/2, 8, 9 1/2 & 21.
1-Symons Cone, 2, 3, 5 1/2, and 7 ft.
6, 10 & 13 inch Superior McCully.

CONVEYOR PARTS

BELT: 1000 Ft. 60 In., 700 Ft. 40 In., 600 Ft. 36 In., 800 Ft. 30 In., 1042 Ft. 24 In., 517 Ft. 20 In., 297 Ft. 18 In., 500 Ft. 16 In., 300 Ft. 14 In.
IDLER: 54 In., 42 In., 36 In., 30 In., 24 In., 20 In., 18 In., 16 In. & 14 In.
Head & Tail-Pulleys-Takeup for all sizes.
Steel Frames: 2,000 Ft. 24 In., 30 In. and 36 In. Sections.

ROTARY DRYERS AND KILNS

36 In. x 20 Ft. 3 Ft. x 30 Ft. 4 Ft. x 30 Ft. 54 In. x 20 Ft. 42 In. x 24 Ft. 5 Ft. x 20 Ft. 5 Ft. x 16 Ft. 5 Ft. x 10 Ft. 6 Ft. x 10 Ft. 6 Ft. x 20 Ft. 6 Ft. x 30 Ft. 10x20, 7 1/2x10 & 8x10 Ft. Kilns.

STEEL DERRICKS

GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom.
20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 35 Ton 100 Ft. Boom, 75 Ton 135 Ft. Boom.

LOCOMOTIVES

GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14, and 30 Ton.
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 40 Ton.
DIESEL: 4, 8 & 15 Ton.

SCREENS

VIBRATING: 2x4, 3x6, 12x8, 3x8, 3x5, 4x5, 4x9, 4x10, 48x72, & 4x12. 1, 2 & 3 Deck.
HUMMER, ROTEX, NIAGARA & ROBINS.
REVOLVING: 3x13, 3x16, 3 1/2x18, 3x24, 4x18, 4x20, 4x28, 4x24, 5x30, 5x30, 6x20.

R. C. STANHOPE, INC.

COMPLETE PLANTS BOUGHT AND SOLD.
40 East 42nd Street New York 17, N. Y.

USED CRUSHING EQUIPMENT

1-Cedarapids Portable Crushing Plant, 1086 Jaw, rolls, power, pneumatics.
1-Gilson "15" Pulverizer Plant w/ power, etc.
1-Primary Crusher w/ 1222 Jaw, power unit, 3-axle chassis, w/ under conveyor, cheap.
1-Portable Conveyor, 34"x50" w/ LeRoll 8 HP. New Belt.
1-Eagle Bucket Loader. NEW. Truck-mounted.
1-Vibrating Screen, 3'x3'. NEW.
1-Universal 36"x25" Vibrating Screen. Used.
1-Universal 30" Bucket elevator line.
2-Bin, 21-yd. Jack-Log. NEW.

SHOVELS AND CRANES

1-Link-Belt "K-44" 1 1/2 yd. Shovel-Drag.
1-Osgood 1 1/2 yd. shovel, w/ crane boom.
1-Lorain "35" 1 yd. Shovel.
1-General 3/4 yd. Shovel-Drag.
1-Speeder "H-1" 1 1/2 yd. Shovel-Drag.
1-Universal 3/4 yd. truck crane.
1-1 1/2 yd. Truck Crane 3-axle truck.
1-Insley "K-10" 3/4 yd. Dragline.
1-Bucyrus-Erie "10-B" 3/4 yd. Shovel-Drag-Hoe.
1-Link-Belt Speeder 3/4 yd. drag bucket. NEW.
1-Hendrix, 3/4 yd. drag bucket. NEW.

POWER UNITS

2-Minneapolis-Moline 88 HP gas power units. NEW.
1-Minneapolis-Moline 38 HP Power Unit. NEW.
1-Minneapolis-Moline 20 HP Power Unit. NEW.
1-Minneapolis-Moline 250 HP Used Power Unit.
1-LeRoll 12 HP 4 cylinder Power Unit. Reconditioned.
1-Waukesha-Herselman 45 HP gas engine.
20-Briggs & Stratton 6 HP gas engines. NEW.

AIR EQUIPMENT

2-Davey "210D" New Compressors.
1-Cleveland "DR-30" NEW Wagon Drill.
3-Wayne 7 cu. ft. new shop compressors.
2-Wayne 2.2 cu. ft. new shop compressors.
1-Wayne 20 cu. ft. New shop compressor.

MISCELLANEOUS

1-Highway Cider Spreader. NEW.
1-Kohler 1500-Watt. Lite Plant. NEW.
1-Homestead "JMI" New Hypersure Jenny.

EIGHTH COMPANY

526 W. State St., Rockford, Ill.

FOR SALE

3-No. 19 Kennedy Van Saun fine reduction crushers complete with drive and 25 H.P. G.E. motors.

1-No. 37-S Kennedy Van Saun fine reduction crusher complete with 60 H.P. G.E. motor, vertical drive including motor, sheaves and V-Belts.

Can have immediate delivery.

V. DI FRANCESCO & SONS
17 Mifflin Ave. Lanerch, Pa.

FOR SALE

1-10x30 Good Roads Champion Crusher, R.B., first class shape.
1-15x36 Cedar Rapids BB Crusher.
1-Barber-Greene Loader on tracks.
1-General 1 1/2 yard, with 35 ft. boom.
1-V. D. 9 International Power Unit on Skids.

COLUMBIA ROCK PRODUCTS CORP.
Columbia, Tennessee

FOR SALE

MINE HOIST-Ottumwa Iron Works, factory rebuilt and never used. 62 inch double cage with 100 H.P. variable speed motor including switch board and controls. Rotary oil cooling pump direct connected to 5 H.P. motor and all incidentals-\$3000.00.

HAYES QUARRIES

338 Railway Exchange Bldg. Kansas City 6, Mo.

FEEDER

Six foot centers
Flight Strips, 30" wide (with extra new heavy duty flight strips).
22" clear feed
Hopper, sprockets and chain in good condition.
Price\$250.00
F.O.B., your truck.

BLUE ROCK, INCORPORATED

P. O. Box 110, Washington C. H., Ohio

BINS: 1-30 ton, 3 compartment, 9'6"x15' with or without 4x6, double deck, vibrator Screen. 1-100 bbl. Blaw Knox Cement Bin. 1-Blaw Knox Aggregate Plant 200 ton, 3 compartment, all steel, with one thousand (1000) bbl. Cement Bin, cement screw, cement bucket elevator, batchers, screens, etc., electrically operated.

BOILER: Erie City 125 H.P., self-contained, Economic type, ASME code, 150 lbs. pressure, complete with all fittings.

BUCKETS: Page 3 1/2 yd. Dragline Bucket. 6-Steubner, all steel, controllable, drop bottom, concrete Buckets, 82 cu. ft. capacity.

CARS: 2-2 1/2 cu. yd., all steel, two-way, side dump, Koppel Cars, standard gauge.

LOCOMOTIVE CRANES: 1-45 ton, National Board boiler, double drums, air brakes. For sale or rent. 1-40 ton, electric, mounted on four MCB railroad trucks, 20' track centers, 110' boom; capacity 7 tons at 100', 45 tons at 20'; current 3 phase, 60 cycle, 220-440 volt.

GYRATORY CRUSHER: Allis Chalmers No. 9, style K.

REDUCTION CRUSHERS: Traylor 4 ft. type TY, with motor, V-belt drive, etc., complete. 1-New Holland 3030 Reduction Mill with 100 H.P. motor; new condition.

ROLL CRUSHERS: Traylor and Allis Chalmers Crushing Rolls, 12x20 and 18x42. New Holland Crushing Rolls 16x16 with 20 H.P. motor.

JAW CRUSHERS: 12x24 to 48x60.

SOFT STONE ELIMINATOR: Stedman Disintegrator, 42" with or without 100 H.P. motor.

HAMMER MILL: Dixie Mogul 20x24, V-belt drive, with breaker plate and extra hammers.

BUCKET ELEVATOR: 14"x54" on heavy single chain, complete.

GAS HOIST: Clyde, two drum, with swinger, 50 H.P. Climax motor.

LOCOMOTIVES: 1-Lima 80 ton, steam, 6 wheel, Switcher with tender, thoroughly modern, excellent condition. Sale or rent. 2-80 ton, standard gauge, Electric, 600 volt, D.C., dual controls, collecting device, powered with four 250 H.P. motors, air operated pantograph; thoroughly modern, new condition.

VIBRATOR FEEDERS: Jeffrey type FB-4, size 47"x84", complete with M.G. set. Jeffrey-Traylor 6'x6', open pan deck, powered by four No. 5 heavy M-4 motors, including motor generator equipment for 440 volt, 3 phase, 60 cycle operation; capacity 1500 tons of earth and stone per hour.

COMPRESSOR: 20x12x14, 250 H.P. synchronous motor, 5 step control. New 1941, used six months.

SHOVELS: Bucyrus Erie 120-B, Ward Leonard control equipment, 3 phase, 60 cycle, 2300 volt.

Marion model 37, 2 yd., steam; Bucyrus Erie B-2, steam 3/4 yd. capacity; suitable for quarry use.

COMPLETE SAND & GRAVEL PLANT: Including 12" electric Dredge, with cutter, bins, scale, pipe, etc. Send for complete inventory.

SCREENS: Robins, Link Belt, Simplicity, Nordberg, Telsmith, Traylor, all sizes.

PULVERIZERS: 3-Raymond, 5 roll, low side, Mills with No. 11 fan cyclone separator.

SCRAPER: LeTourneau 6 yd., model J6, 8 yd. capacity heaped; two tires, front; four rear, size 10x20.

TRACTOR: Lynn 20 ton, 6 cylinder Hercules engine, rear dump, steel and wood body.

TRUCKS: Euclid 18FD, 15 ton capacity, 10 yd. body, end dump, heavy duty, 200 H.P. Cummins, supercharged, Diesel Motors; tires-front 12x24, 16 ply; tires-rear 14x24, 20 ply; built December 1942.

OVERHEAD ELECTRIC CRANE: 1-7 1/2 ton, Shepard, four motor, bucket operating, 36' span, 550 volt, D.C., cage control.

MINE HOISTS: 1-150 H.P., drum 72x72", 1-450 H.P., drum 10' dia., 7' face, 1-600 H.P., 96" dia., 116" face, 1-120" dia. x120" face, with 500 H.P. motor. All 3 phase, 60 cycle, 2200 volt.

TRUCK SCALE: Fairbanks 48,000 lbs. capacity with 9'x24' platform.

TRANSIT MIX TRUCKS: 4-Federals, 2-Whites, with 4 cu. yd. mixers, 1942 models.

A. J. O'NEILL

LANDSDOWNE THEATRE BUILDING
LANDSDOWNE, PA.
Phila. Phones: Madison 8300-8301

FOR SALE

INDIANA LIMESTONE COMPANY, Inc.

BEDFORD, IND.

Crusher Plant—Dickinson Mill

- 544—Centers 24", 6 Ply Rubber Belt Conveyor, wood frame, 30" x 26" tall pulley with take ups. No Belt. Manufactured by Stephenson-Adamson Mfg. Company, Aurora, Ill.
- 1—Size 15" x 30" Belt Drive, Geared Stone Crusher. Ser. No. 633. Mfg. by Pennsylvania Crusher Co.
- 1—92" Centers, 30" Steel Feeder Conveyor. Manufactured by Stephens-Adamson Mfg. Co., Aurora, Ill.
- 1—36" x 42" x 42"—1/4" Steel End with Hopper Bottom.
- 1—62"0" Centers Bucket Elevator, 7" Channel Frame, 24" Rubber Belt with 24" x 15" x 10" Steel Buckets, 24" centers. Manufactured by Stephens-Adamson Mfg. Co., Aurora, Ill.
- 1—60" x 8" Hum-mer Shaker Screen, Type 39. Manufactured by W. S. Tyler, Cleveland, Ohio.
- 1—Air Bag Filter with 3—36" x 9" Receivers. Manufactured by The Northern Blower Company.
- 1—No. 45 Clorage Type SP Steel Plate Drive Exhauster, Top Vertical Discharge. Ser. No. 12784. Manufactured by Clorage Pan Company, Kalamazoo, Michigan.
- 1—30" Centers Bucket Elevator, 7" Channel Frame, 24" Rubber Belt with 24" x 15" x 10" Steel Buckets, 24" Centers. Manufactured by Stephens-Adamson Mfg. Co., Aurora, Ill.
- 1—Size SX4 Pennsylvania Stone Crusher, Ser. No. 743. Manufactured by Pennsylvania Crusher Company, Philadelphia, Pa.

CRUSHERS

GYRATORY: 48" Gates K. 30" Superior McCully (like new). 30" Superior McCully Gates Nos. 12, 10, 8, 6, 4, 3, 2, 1 (75 avail.). Tolsonith Nos. 4, 5, 8, 8C, 9 & 18. Also many Austins, Kennedys and Traylor, many sizes.

JAW TYPE: Traylor 60x24, 48x20, 42x18, 36x12, 30x10, 24x8, 20x6, 18x5, 16x4, 14x3, 12x2, 10x1, 8x1, 6x1, 4x1, 3x1, 2x1, 1x1. Good Roads 1030. Acme 24x10, Misc. 7x12, 9x10, 8x20, 6x24, 12x24, 9x36, 15x36.

REDUC. TYPE: Kennedy Nos. 25, 27 & 49. Tolsonith 3-F & 40. Traylor 30" T2, 8", 10", 12". Super. McCully 6"x10". Newhouse 5, 7, & 10". Symons Cone & Disc Ty. 2" to 4".

ROLLS: Allis-C. 12 1/2"x12, 30x10, 40x15, 34x24 & 72x30. Fairmount 30x20 & Jeffrey 34x24 to 36x24 single roll. Bonish 36x14 & 42x18, Etc.

HAMMERMILLS: Williams No. 1, 2, 3, 4, 5, & 9. Jeffrey 36x18 & 36x42. Day Nos. 20 & 40. Etc.

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822-Q=

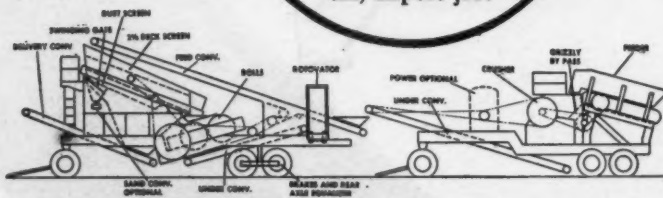
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HIGH PRODUCTION



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This is part of the story—read the rest in Bulletin 30.

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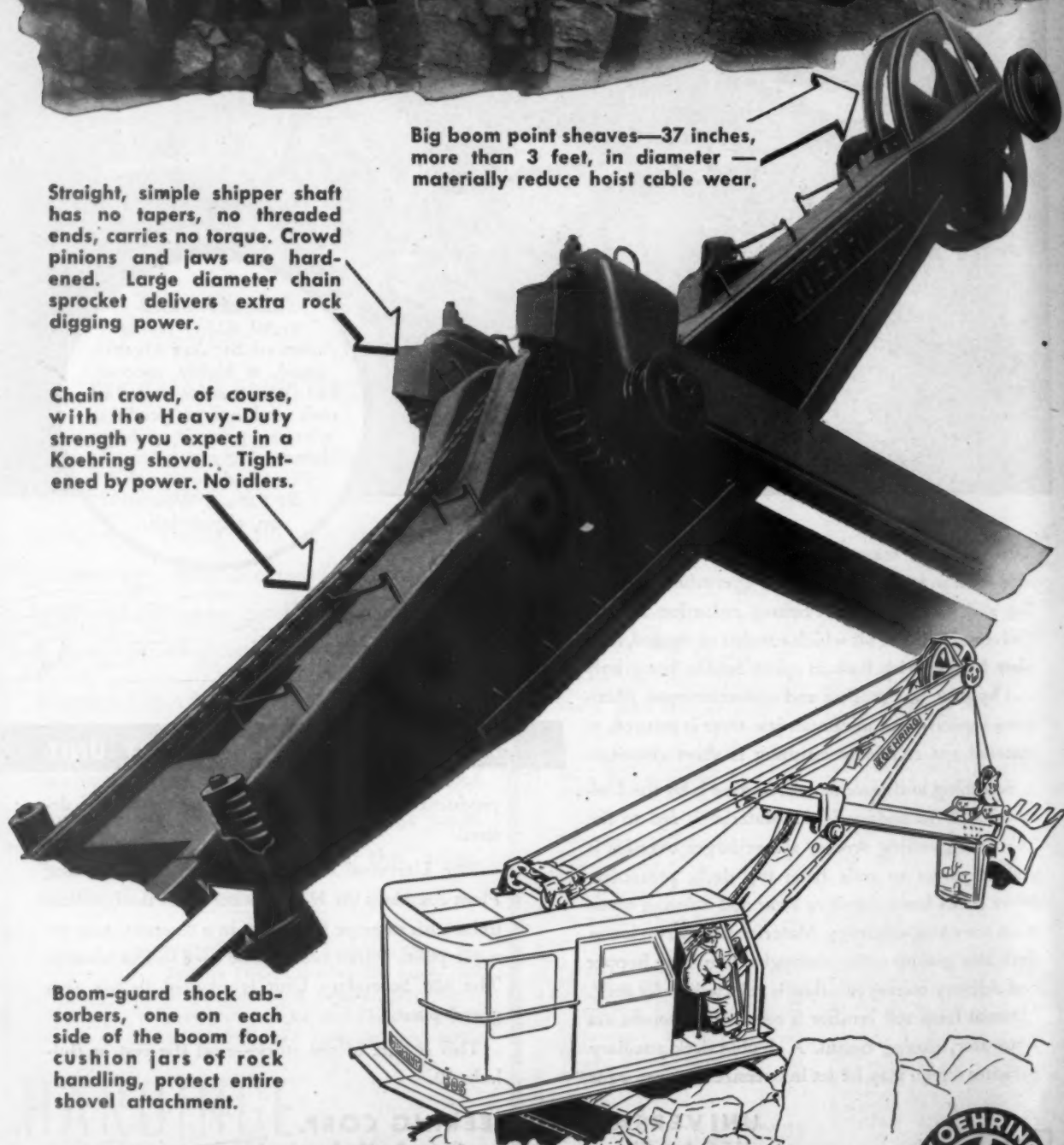
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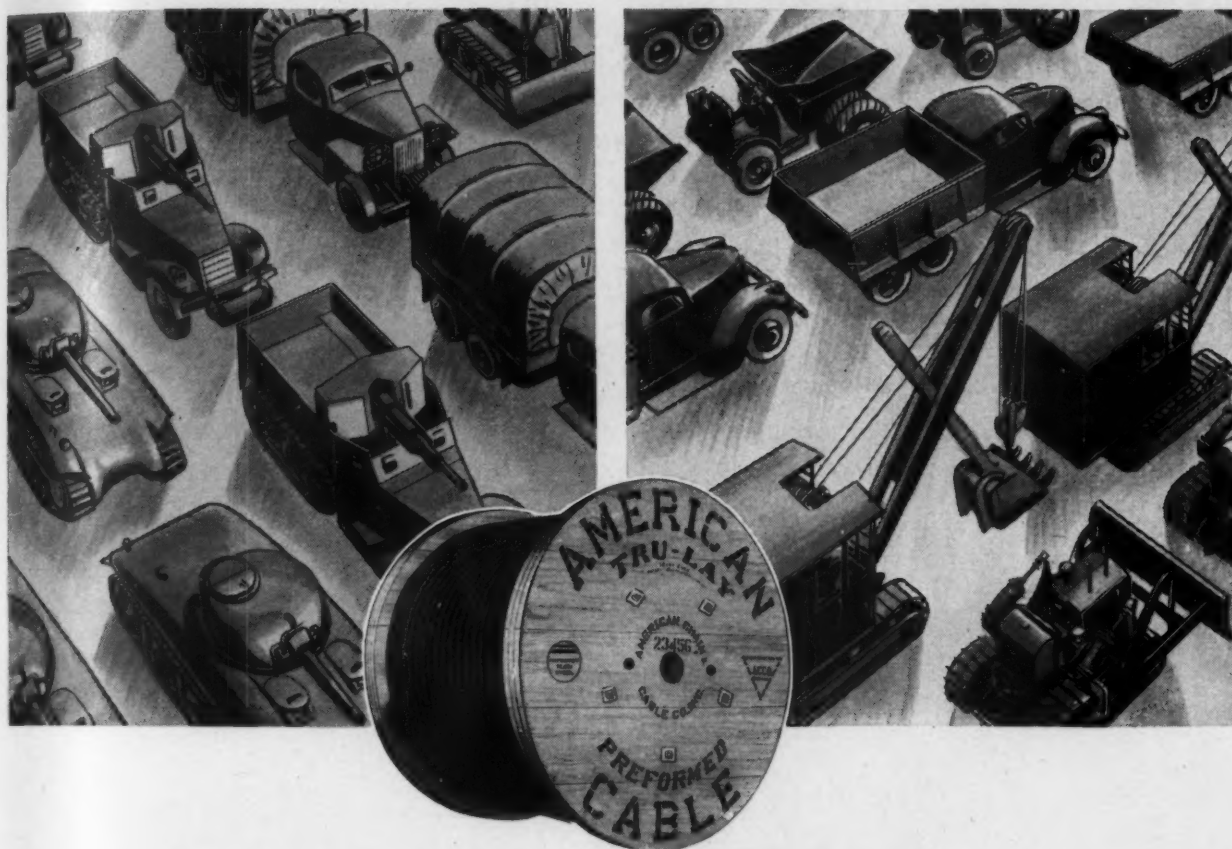


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